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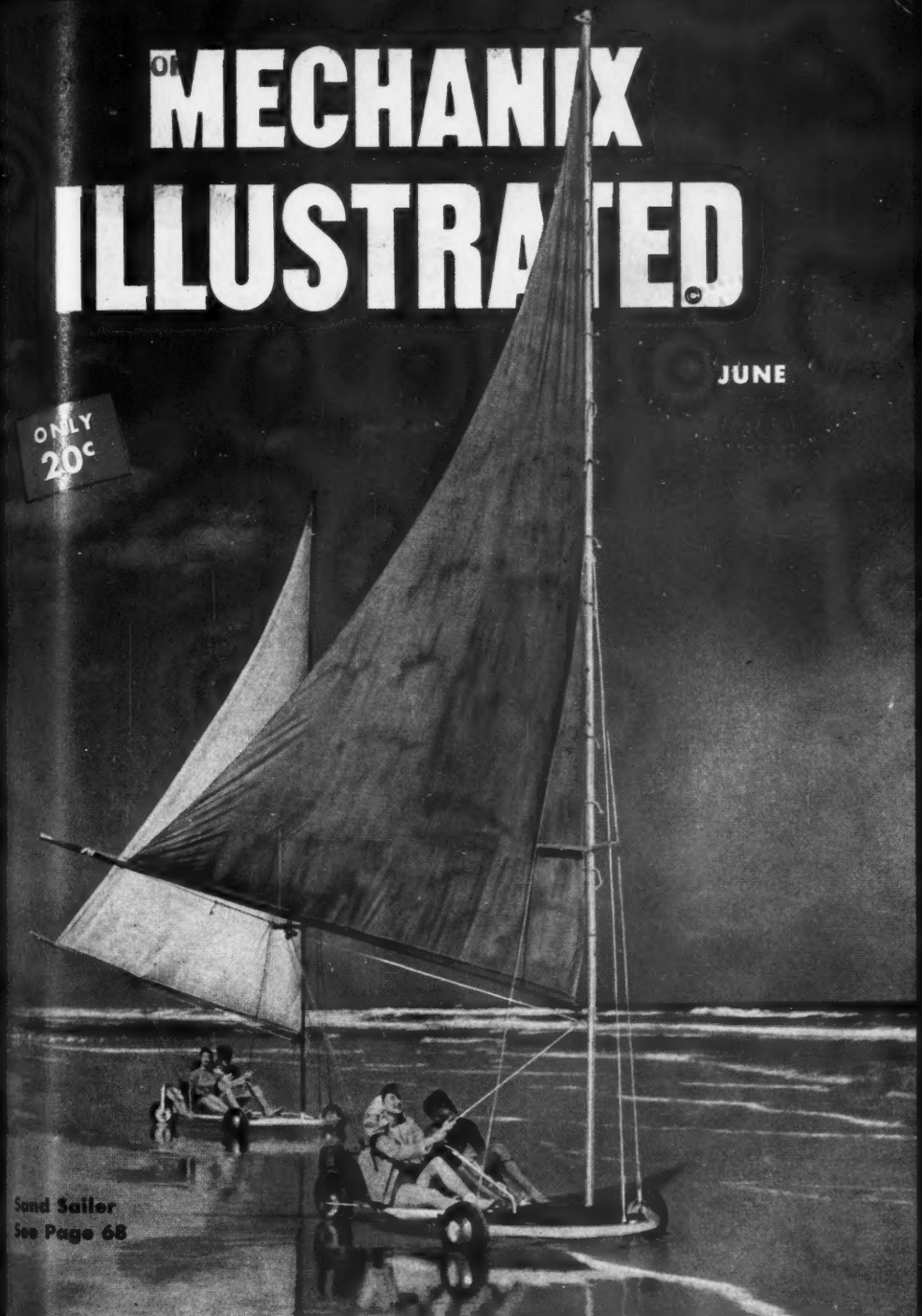

Sand Sailer
See Page 68

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JUNE, 1947 — VOL. XXXVIII, No. 2

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SPECIAL FEATURES

Sentinels of the Sea 49
by Capt. C. H. Peterson
Light, sound, buoys, men—for sea safety

Tree Doctors 52
by Henry F. Unger
Outdoor vocation for surgeon-Tarzans

One-Step Camera 56
by Norman Lipton
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by Logan Reavis
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Inside a Shot Tower 64
by Sid Latham
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Sand Sailer 68
Sail your boat along the beach—
But don't go in the water!

"Fly" Fishing 70
Just hitch on the canoe and fly to the lake

Electric Cannon 71
by Willy Ley
The solenoid as a piece of artillery

Electrons for a Microscope 74
by John C. Adler
It may be man has seen a molecule

Little Wing 78
by Gilbert C. Close
Airplane model fans, match this!

New Ears for the Deaf 80
by Gold V. Sanders
Mighty midgets are these new hearing aids

Helicopter Bus Service 84
by Andrew Messick
Soon you'll be able to fly *all* the way

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Scientific doodads a-coming your way

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by C. B. Colby
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by Louis Hochman
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Shore-Line Sailors 102
These sailboats leave their crews on shore

Can You Canoe? 104
by C. W. (Todd) Denner
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by Tom McCahill
Hurrah for the glamour cars of yesterday!

(Craft and Hobbies, see page 6)

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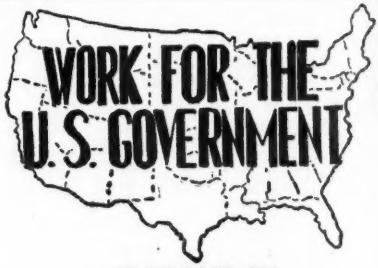

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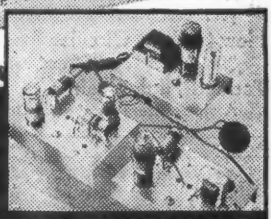

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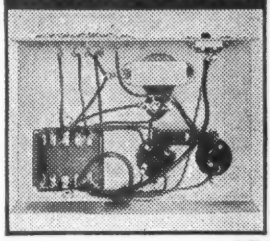

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CONTENTS

[*Continued from page 2*]

CRAFTS AND HOBBIES

The Fourth Annual Color Photo Contest 112
$300.00 in Cash Prizes

MI Contact Printer 114
by Robert Brightman
After you've built this, you'll wonder how you ever got along without it

Photo Handies 116
Two pages of darkroom timesavers

The Question Box 116
Answers to your photo problems

Graflex Film Reducer 118
Two film sizes with the same camera

Monthly Photo Contest 119
How about submitting *your* work?

DeLuxe Record-Changer Cabinet 120
A sleek hardwood case for your automatic phonograph

Building Barnacle 122
An 11-foot sectional rowboat that fits into your car trunk

How to Use a Circular Saw 130
"Do's" and "don'ts" and safety hints

Padded High Chair 132
A tip-resistant throne for Junior

Home and Shop Kinks 134
Short cuts and handy "helps"

Nieuport Scout 136
A control-line version of the famous World War I fighter

Build with MI Plans 141

Car Care 142
by Fred Russell
Overhauling?

Behind the Wheel 143
Ask Russell, he knows!

Boats and Boating 144
by William F. Crosby
This month: How Safe Is Your Boat?

Storage and Cyclone Cellars 146
by Dale Van Horn

Raise Your Own Live Bait 149
Bait—in your own back yard

Upholstered Barrel Chair 150
This barrel chair is really made from a barrel

Maple Pen Set 152
A lathe-turning project

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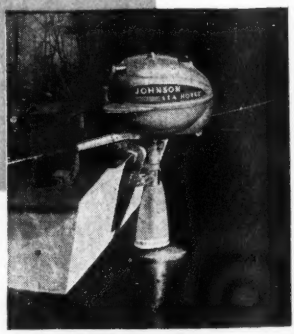

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The patent laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent in order to comply with the requirements of the U. S. Patent Office. For that reason, the Patent Office advises the inventor to engage a competent registered patent attorney to prepare his application for patent and represent him before the U. S. Patent Office Examiner.

A specially prepared booklet containing detailed information with respect to patent protection and procedure will be forwarded to you without obligation upon request.

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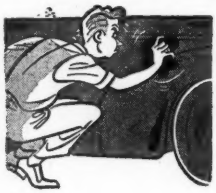

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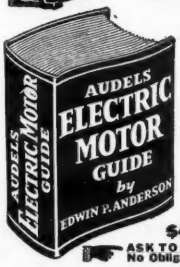

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I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

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CHIPS from the EDITOR'S WORK BENCH

"Race to the Planets!"

Some time in the next few years scientists are going to land an unmanned guided missile on the Moon. And some time within your lifetime (if you're not too old) a handful of daring Earthmen are going to make a trip to the Moon—and return.

It's in the cards. It's absolutely predictable. In both the Old World and the New, earnest groups of scientists, hard-headed and practical men, are intensely at work on the problem. The British Interplanetary Society is a strong contender for first honors. In America, Army Air Force missile experts are quoted as saying that they expect to be able to put a rocket on the Moon within 18 months, and that interplanetary travel is probable within 30 years.

The question arises: Who will be the first to stake a claim on the Moon?

MI, aware of the tremendous implications of the situation, has probed behind the scenes, and next month we are presenting 16 solid pages on the coming "Race to the Planets!"—a story by Willy Ley summing up the technical problems being faced at the moment, an exclusive account by Alfred Eris of what's going on in England, including the projected "living wheel" space station, and many pictures and diagrams, both in black and white and in color, that carry on where words must leave off. Willy Ley you know well from his other scientific writings—but perhaps you do not know that he is a pioneer rocket man: he's designed rockets, built them, flown them, written about them, ever since the possibility of space travel began to look practical about 20 years ago. The many color paintings have been especially made by Chesley Bonestell, the well-known artist.

In MI, then, next month, you'll find an accurate, imaginative, *authentic* account of the problems and promises of the coming conquest of space. Come in on the greatest adventure in human history!

MOTORIZED WHEEL CHAIR

We're sending Kenneth Ginsterblum of Osage, Iowa, a Workbench Award and a $10.00 check for designing and building this wheel chair. It is powered by a ½ hp. 12-volt motor using two 6-volt batteries and will run for six hours on a charge at speeds up to 6 mph. The chair is patented and Mr. Ginsterblum expects to market it so that he can help other people like himself who are similarly handicapped.

For the Photo Fans

Two items appearing in our photography section should interest many of our photo fans. Item No. 1 is, of course, the announcement of our Fourth Annual Color Photo Contest. The balmy skies of June and warm weather should indeed be an incentive to go and "take 'em." Send your entries in. The Editor is just as anxious to see them as you are to get your shots back from the processing lab.

The second item: Quite a number of MI readers have written in lately requesting information on the construction of a contact printer. After a bit of prodding, we convinced our Photo Editor that he ought to reveal the contraption that he uses to do the dirty work in his darkroom. Accordingly, on pages 114 and 115 you will find detailed drawings and pictures showing the construction of a contact printer that will take negatives up to and including 4x5 inches as well as postcard-size films. •

Are Your Brain Cells Rugged?

Go-getters have rugged brain cells. Discovery of this organic basis for the aggressive personality was made by Dr. T. C. Barnes of

[*Continued on page* 14]

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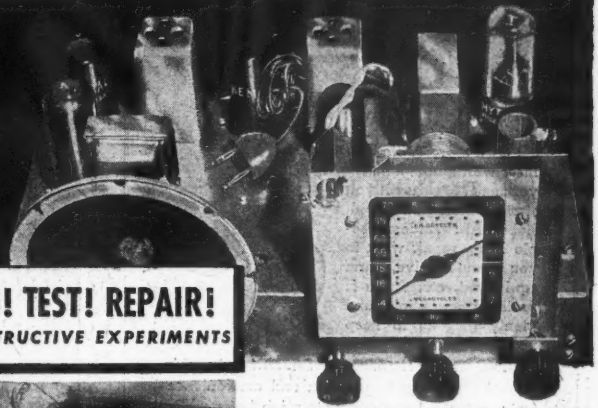

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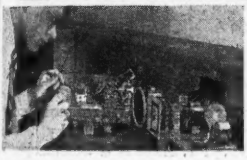

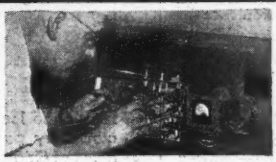

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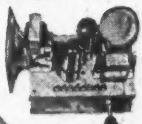

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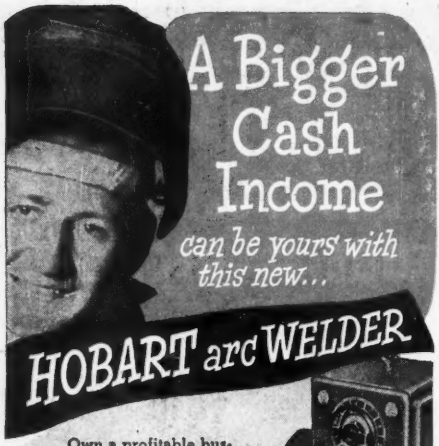

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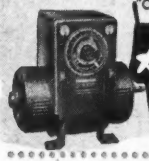

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Editor's Workbench Chips

[*Continued from page* 12]

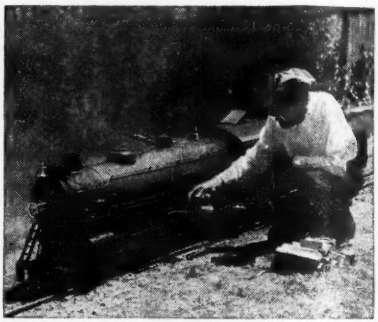
Hahnemann Medical College, Philadelphia.

The rugged quality or, as Dr. Barnes phrases it, "the ability of healthy brain cells to withstand severe conditions," showed up in brain wave records.

The severe condition was the over-alkaline condition, called alkalosis, produced by deep breathing.

Among the normal persons Dr. Barnes tested, those with very aggressive personalities had the most normal brain waves when subjected to this strain of breathing deeply for several minutes. An unsatisfactory emotional life is found in those whose brain waves become abnormal in deep breathing.

LOOK, HO FANS, REAL STEAM!



Here's the locomotive of a model railroad that can carry passengers. It was built by J. E. Sikes of Griffin, Ga. Mr. Sikes is a watchmaker and built this loco in four years of spare time, using his garage as a workshop. It will burn coal or wood. At present it is pulling coaches full of children at the Municipal Park around a 200-yard circuit. Nice going. A $10.00 check is highballing down to Georgia.

Army Wants Supersonic Camera

There is a job ahead for the camera maker. The Army feels that it will soon need motion picture cameras that will take clear pictures of the earth when airborne nearly 20 miles from the surface and traveling in planes at 1,500-mile speeds.

Man's continual climb toward stratospheric heights and his persistent thrust toward supersonic speeds have revolutionized present needs. Aerial motion picture photography has successfully met the challenge of the present, but only research will permit us to photograph things to come.

One apparatus capable of development is the radar recording camera, the O-5A, now used to track guided missiles. Two others are

[*Continued on page* 16]

INVENTORS

Patent Laws Encourage The Development Of Inventions

The Rules of Practice of the U. S. Patent Office advises—unless an inventor is familiar with such matters—that he employ a competent registered attorney, as the value of patents depends largely upon the skillful preparation of the specifications and claims.

The firm of McMorrow, Berman and Davidson is registered to practice before the U. S. Patent Office. Additionally, it maintains a staff of attorneys able to readily understand inventors' disclosures, to advise concerning patentability, and to prepare appropriate specifications and claims for filing with the Patent Office.

If an inventor believes he has an invention, a search of the most pertinent prior U. S. patents should be made and a report obtained relative to its patentability. Where such report indicates that the invention appears patentable, in order to secure protection, diligence should be exercised in making application for a patent.

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Send me further particulars as to patent protection and procedure and "Invention Record" form at once. I understand that this request does not obligate me.

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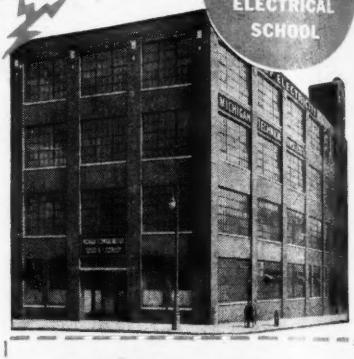

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Editor's Workbench Chips

[*Continued from page* 14]

the A-6, a combat recorder ideally suited to ever-increasing altitudes, and the S-7 continuous strip camera which may soon chart the heights and depths of the world in color.

Shadowless Lighting

Lighting especially designed to permit one group of people to enjoy a television show while others in the same room read or play cards, a kitchen with fluorescent lamps concealed in cabinets to give a high level of virtually shadowless illumination directly on work surfaces, and a combination bedroom-den decorated in light are features of the newly restyled rooms of the Sylvania Lighting Center in New York City.

The redecorated rooms incorporate black light, germicidal light and infrared heat lamps as well as new adaptations of both tubular and circular fluorescent lighting combined with the latest incandescent floor and table lamps.

The basic idea throughout the five rooms—a combination television-living room, bedroom-den, kitchen, bathroom, and study—according to Don P. Caverly, Director of the Sylvania Lighting Center, is to make light itself an integral part of the decorations.

Fuel for 1,000 Years

There will be plenty of gaseous and liquid fuels available in America for a thousand years or more, according to Arno C. Fieldner, chief of fuels and explosives of the U. S. Bureau of Mines.

These fuels may not be petroleum products, however; they will be derived from coal and lignite, of which there are abundant reserves. Production from these sources will increase as the reserves of petroleum and natural gas approach exhaustion.

Mr. Fieldner estimates the known fuel reserves of the United States at an energy equivalent to 2,600,000,000,000 tons of bituminous coal. Approximately 55% of this solid fuel is high-volatile bituminous coal, 23% subbituminous coal, 19% lignite, 2.5% low-volatile bituminous, and 0.5% anthracite.

A declining supply of petroleum can be supplemented also by alcohol from the fermentation of vegetable matter, conversion of natural gas by the gas-synthesis process, and the distillation of oil shale.

Top Blows Its Top

The fastest spinning top in the world has blown up. It was going so fast it exploded.

This odd scientific report was made by Prof. J. W. Beams and James L. Young of

[*Continued on page* 18]

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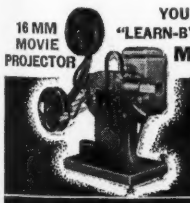

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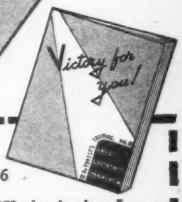

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Jerry, the talking dog, is entertaining hospitalized veterans, by courtesy of the PYROIL Company. Picture of Jerry sent on request.

Editor's Workbench Chips

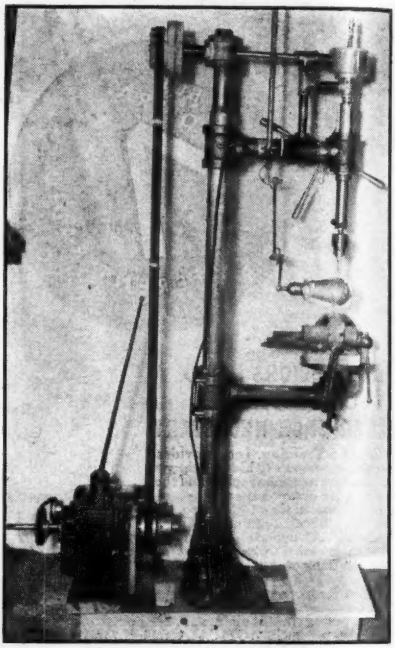
[*Continued from page* 16]

the Rouss Physical Laboratory, University of Virginia.

The Top was a tiny steel centrifuge with a diameter less than that of the lead in a pencil. In a test to determine its strength, the scientists managed to spin the bit of steel rotor at a speed of 633,000 revolutions per second.

At that point it disintegrated. The centrifugal force was 428,000,000 times as great as the normal force of gravity.

PIPE FITTINGS DRILL PRESS



This unusual drill press is powered by a ½ hp motor driving through a Chevrolet transmission. It's a very sturdy affair, reader Francis L. Tyler of Penn Yan, N. Y., informs us. A Workbench Award and a $10 check should reach you by the time you read this paragraph, Mr. Tyler.

Movie Explains Home Photo Lighting

The use of a simple lighting formula equally suited to indoor movie shooting or still photography with flash, flood or spot lights is entertainingly presented in the new General Electric photolamp movie—"The Family Album." Filmed in color, the 16mm sound production will soon be available to pho-

[*Continued on page* 30]

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Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed in inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Buoyancy Operated Motor

Hobart M. Gibson of Springfield, Ohio, sends a design for a buoyancy operated wheel and states that he is not at all satisfied with the explanations offered by many mechanics to whom this has been shown. He states that if he is not mistaken he should have a 3,000 pound variation on opposite sides of the wheel.

ANSWER: *The fallacy of the reasoning here is that you are attempting to analyze the entire operation from a static and idealized state. Just how did you get the air into the pockets on the "lighter" side of the wheel? That air did not get in by itself. It had to be pumped in. Now, just as much energy is required to inflate the tanks as those same tanks will deliver on returning to the surface, discounting friction.*

This means that you cannot possibly get any motion. The deeper each tank is under water the greater the amount of work which it will do, but by the same token the greater is the energy needed for pushing the air into it.

But you cannot discount friction. It is very much in evidence in this construction. Hence for each horsepower of energy you put into this mechanism you will be fortunate indeed if you can get a fifth as much out of it.

Nor is the basis of this design new. It was illustrated as early as 1823, "reinvented" in 1834, described again as a scientific wonder in 1890 and has been resurrected periodically ever since. You just have nothing here except a puzzling problem for your mechanically minded friends. Any physicist should be able to give you a clear analysis of reasons for non-operation.

Toothpaste Tube Closure

Morris Letnick of Montreal, Quebec, Canada, states that he has been "reading the Clinic ever since I can remember." He claims we always find fault with tube closures, so he submits one in which air is drawn back through the opening to clear the passages.

ANSWER: *We find fault with this also. Contact with air hardens the paste. The whole problem is so simple to outline. You just need an inexpensive device which automatically will close the tube but leave no paste at or around the opening. It is the solution to the problem which is the poser. Your suggestion for a ladder conversion is very old.*

Lettering Pen

Melvin S. Martin of New Holland, Pennsylvania, submits a design for a new lettering pen for draftsmen; the unit is to have interchangeable points.

ANSWER: *This might be a good stunt if you could get it to work properly. There just doesn't seem to be any sense to going ahead with this idea until you know that it will work. There is much doubt that in its present style you could get it to operate properly, but we think the design could be modified to such a degree that a highly satisfactory product would result. Our recommendation is that you do some tall planning and extensive experimental work. Both should be much worth while.*

Dog Leash

Russell R. Dimmig of Hatboro, Pennsylvania, submits a design for a come-back dog leash on which he would like advice.

ANSWER: *A dog leash strangely similar to your design was popular in 1941. We have not seen it make its reappearance, but chances are it will be available again. If memory serves correctly it had a 12 foot braided cord which could be locked in any position. We are afraid you are a number of years too late with your suggestion.*

Drill Stop and Countersink

J. E. Bovee of Seattle, Washington, states that he has patented a stop for drills which can be speedily attached and which also countersinks to any depth during the drilling operation. His questions are made clear in the reply.

ANSWER: *This appears to be a good tool. We*

[Continued on page 22]

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Your Invention Clinic

[*Continued from page* 20]

assume that it may be attached to drills of various sizes, that the attachment is simple and speedy and that the mechanism functions properly.

You may find that some of your letters to manufacturers will remain unanswered. But you need not wait for a reply until you make another effort at a sale. Invest a few dollars in copies of your patent and send a batch of letters to manufacturers, each with a copy of the patent, to tool manufacturers whose materials come within the scope of your product. We feel sure that some alert manufacturer will see the possibilities in this invention and will measure the value of adding this article to the line of merchandise he makes. Meanwhile, try to set a reasonable figure for sale with royalty and recapture rights. Consult with your attorney on this. If all your efforts remain unsuccessful, you can always have the product made for you and negotiate for distribution yourself. This effort should be made, in our opinion. Don't drop the idea; it should return dividends.

Garbage Can Liners

Ronald Jobel of Sherbrooke, Quebec, recommends a paper liner for garbage cans and claims that if the items were on the market he should have encountered them because of his occupation as a hardware salesman.

ANSWER: *We don't know about the situation in the territory you cover, but disposal bags for lining garbage cans were available in many five and ten-cent stores throughout this country. Shortage of paper stocks interrupted production of these liners but they will be back.*

Coin Wrapper and Counter

Hermann Miehle of Long Island City, New York, has designed a small hand unit for wrapping coins in paper; it also "counts" coins by measure.

ANSWER: *We think this is a swell idea if it can be made to work properly even without the so-called counting feature. The latter would be hopelessly inaccurate for the reasons stated by you, namely that the thickness of coins would vary depending on whether they are worn or not. Banks require accurate counts. But will the article take dimes and quarters with equal facility and permit turning over the edges of the roll without dislodging the stack? If so, and you can prove it by a model, then a patent search should be made right away.*

No, the retail price based on your production cost would be $4.25 for each coin roller. Perhaps you could raise it a bit and furnish a

[*Continued on page* 24]

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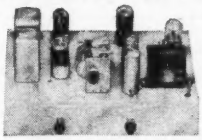

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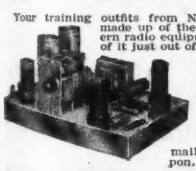

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Your Invention Clinic

[Continued from page 22]

better product for a sales price of five dollars. It should be worth that to any bank.

The chance of going into business appears good. You can have the product made and have it advertised through normal bank channels and by direct mail to the many banks where such a device would save time and, in particular, nerves of the personnel. Order of procedure should be: model, test, search, patent, and during the last period of waiting for grant proceed in getting the item ready for the market.

Knob Handle

S. J. Thompson of Parker Dam, California, submits a design for a handle which can be attached to any door knob thus making it easier to operate the latch. He states that patent has been applied for and that he is having some difficulty in getting a manufacturer to express interest in the product.

ANSWER: *Let's be practical about this. There is no reason why a ball shaped knob on doors could not be changed to a straight or highly ornamental handle. Such a handle could be cast easily. Its cost would be less than your attachable handle and no royalty need be paid anyone. Its rigidity would be greater than any device made similar to the design recommended by you. The only thing of value which you have, in our opinion, is a well thought out article, but you seem to have let the good design sway your judgment. There is one faint hope that you could market the item, and that is to try to make colored door handles a vogue and introduce the item in the form of colored plastics requiring no tools for attachment. Having gone this far you might risk the extra time. Invest further funds only if you are guaranteed a market.*

Electrically Heated Water Bottle

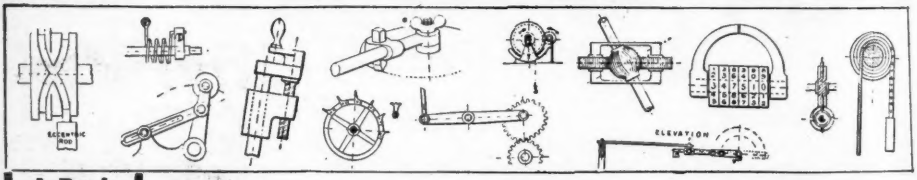
William G. Makarchuk of Benito, Manitoba, Canada, suggests a thermostatically controlled heating unit to be inserted into a hot water bottle. He wants our advice.

ANSWER: *As long as you must use a heating element and a thermostat, why not spread the same wires in a blanket and make a regular heating pad from the same materials? It would be less expensive than the combination with a hot water bottle.*

The reason for hot water bottles is that current is not required yet heat is retained for a long time. We cannot see that your combination offers anything attractive except in a highly specialized case. You did not outline

[Continued on page 26]

HOW TO EFFECT ANY KIND OF Motion or Movement



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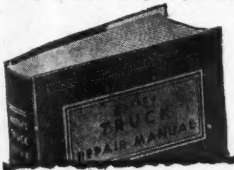

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Your Invention Clinic

[*Continued from page 24*]

such use in your communication; but if you have such a specialized purpose in mind the idea might bear investigation and simplification.

Parking Device

Alden W. Ayars of Atlantic City, New Jersey, states that he has made a gadget to enable drivers to park cars in tight places. His other inquiries are made clear in the reply.

ANSWER: *Yes, all communications to this department reach me. Unfortunately there are many to which an early reply is not possible, there being only 24 hours per day. Now, you did not enclose diagrams, so only a generalized reply can be offered. If your device is a gadget, easily attachable and semi-automatic or mechanically signalling for correct technique then further action might be suggested. But remember, sales will be ten times as great if anyone can attach the item to any make of car than if it requires the services of an auto mechanic.*

Train Seat Cover

Ludovic N. Plourde of Clinton, Maine, suggests a cover for train seats which would allow travelers to put their feet on the seat in front of them.

ANSWER: *In our opinion you haven't a chance in the world of getting an acceptance of this idea, even should you be able to patent it. We feel quite sure that manufacturers of railway cars did not design them so that the rider could occupy two seats, and they certainly are not going to add a gadget to the seat which will, in effect, induce every traveler to make use of two seats, for the price of one fare. But don't think that the leg comfort of passengers has not been thought of before. Prior to 1883 someone patented a strap which hung from the seat ahead. Passengers could hook their legs over the strap and let their feet hang. Doesn't impress us as being either comfortable or desirable. Passenger comfort on trains or audience comfort in theatres is much to be desired, but economically unsound. Both try to cram as many seats as possible into the limited area, except perhaps in higher priced coaches or more expensive box seats. Even here the long legged or stout person is out of luck.*

Protractor

Willard E. Stephens of Columbus, Ohio, submits a design for a protractor with a bent arm fitted with a magnifying glass. He claims that the idea is patentable and wants to know

[*Continued on page 28*]

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Your Invention Clinic

[*Continued from page 26*]

about the chances of selling the invention if it is protected.

ANSWER: *Apparently you had a magnifier which required that you bend the arm to fit the lens. This is not necessary at all. Get the correct lens and you can eliminate the bend. Then, perhaps, you will have little on which to base a patent claim but would have a more sturdy and more accurate tool. Just take a look at the lens on a slide rule and you will see what we mean.*

Lighter

Joseph B. Reynolds of Lawton, Oklahoma, sends a photostatic print of an application for a patent on a lighter with a fuel tank for refilling the wick compartment.

ANSWER: *This design seems rather dangerous; its method of operation is quite clever, however. It is quite possible that the construction could be made about as safe as a gasoline lamp or torch. But a slight mishap, a leak or overflow, might give a disastrous result. By this time your patent should be well along. Suggest that you make a model, test it, determine how long it will hold fuel, then use the information thus gained as a basis for your argument for a sale.*

Perhaps you could say that such a lighter will hold a six months' supply of fuel yet is no larger than an ordinary lighter. But watch your step when working with your sample. There just is no such thing as a safe gasoline lamp particularly when you cannot guarantee against possible leakage.

Stereoscopic Pictures

J. C. Hinson, Rockingham, North Carolina, wants to know if we think it a good idea to work upon stereoscopic picture systems.

ANSWER: *Dozens of systems have been developed for producing stereoscopic pictures. You disclose no details in your communication. You may have something, and then again you may not. It may be that your device is no better than any of the others which has been presented before.*

The chances are ten to one that if you are able to develop a device for producing stereoscopic pictures which will not use special eyeglasses, filters, revolving shutters, or any of a hundred and one different devices heretofore designed to aid the eyes in viewing the stereoscopic screen, and if the pictures which you project or examine are truly stereoscopic in nature, you probably have a very good opportunity to market the product. Remember that costs involved are an important consideration.

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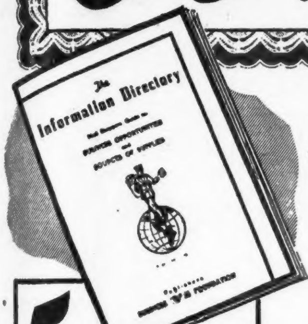

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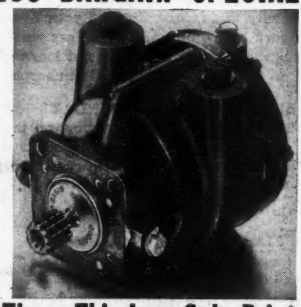

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Editor's Workbench Chips

[*Continued from page* 18]

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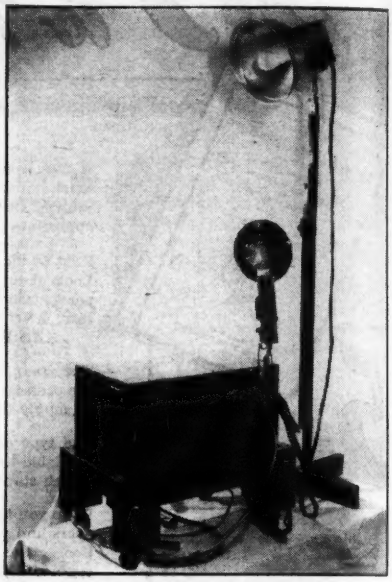

About a month of spare time enabled Paul S. Hoffman of Dayton, Ohio to build this semi-portable high-speed flash lamp. It is made entirely of standard radio parts. Plans for a high-speed repeating flash outfit appeared in the December, 1946 issue of MI. Congratulations, Mr. Hoffman! A Workbench Award and a $5.00 check are on the way.

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[*Continued on page* 32]

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Editor's Workbench Chips

[*Continued from page* 30]

wax-like chemical sticks recently patented.

The process is simple. The fabric is laid on a clean under-cloth and sponged; then what is called the acidic stick is daubed on until no more stain appears on the under-cloth. After again rinsing the spot, the second stick, a reducing stick, is applied and the spot disappears.

The chemicals used in the wax-like sticks are based on what is known technically as polyethylene glycols. Glycol is an alcohol, but not the ordinary type. Chemically it is between ethyl alcohol and glycerine, which is also an alcohol. The acidic stick contains an acid salt of oxalic acid and tri-ethanolamine, a product made by treating ethylene with ammonia. The reducing stick contains powdered sodium bisulfite or other reducing material.

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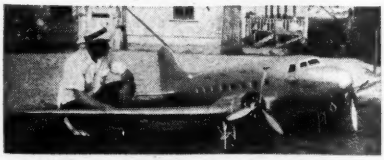

Herbert E. Fey of New Braunfels, Texas, built this model DST out of 600 assorted tin cans in 3½ months of spare time. It's a very realistic-looking job for which the Editor is glad to send him a Workbench Award and a $5.00 check.

Mass Sterilization

Now you can add to the horrors of war the possibility of making all the people of a nation barren without their knowing they had been sterilized.

This possibility was explored by Nazi physicians, according to Dr. A. C. Ivy, vice-president of the University of Illinois. Dr. Ivy has just returned from a government mission on which he was the American Medical Association representative to investigate war crimes of a medical nature.

Putting the dried juice of a plant in the food of a population and exposing men and women to a castrating dose of X-rays while they filled out government forms were two methods of secret mass sterilization studied by Nazi physicians.

Tire Has Wire Cord

Substituting high tensile steel wire for cotton and rayon cord, Firestone is now producing what engineers say is the most rugged

[*Continued on page* 34]

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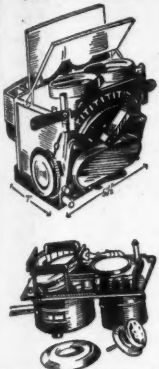

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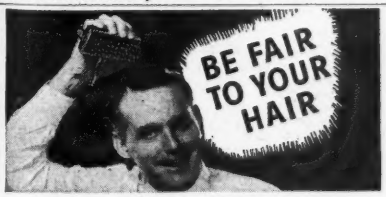

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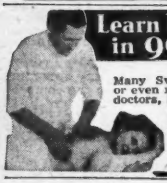

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Editor's Workbench Chips

[*Continued from page* 32]

pneumatic tire ever built—the long awaited wire cord tire.

The new tire runs cooler under heavy loads at high speeds, has never been known to blow out, and because of its great body strength it can be recapped several times, it is claimed.

The idea is not new. However, the obstacles that were surmounted in using hair-like strands of high tensile steel wire, twisted into cords in tire construction, is definitely an achievement.

Great precision is required to place each strand of wire so that it carries its full share of the load. In building cords of cotton or rayon into tires, slight variations are permitted because the process of stretching, or flexing, tends to bring all cords into play.

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MODEL ICE BOAT

Something unusual in the line of models is this miniature ice boat made by Donald C. Morton of Muskegon, Mich. Constructed of mahogany with stainless steel runners and handmade brass hardware, the model is 30 in. overall from bow to stern runner with a 16 in. main plank. A $5 Workbench Award is going to Mr. Morton for his fine detail and craftsmanship.

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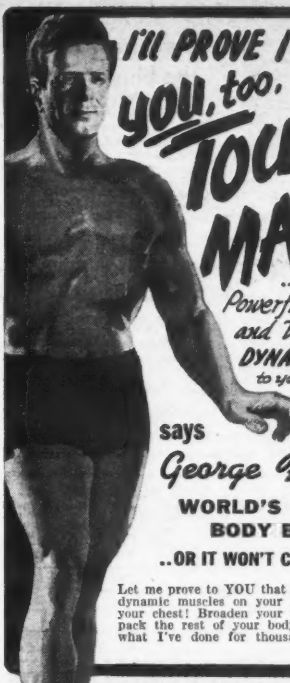

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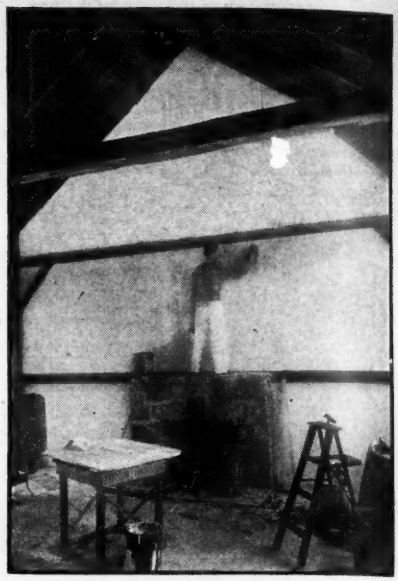

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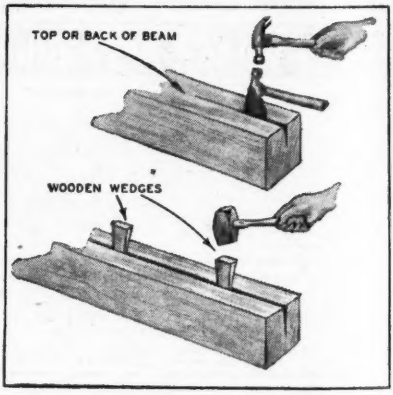

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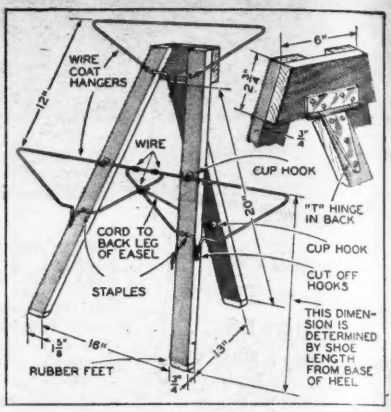

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Aside from the three wire coat hangers, all you'll need are a few scraps of wood, three cup hooks, staples, a T hinge and three rubber feet—about 25 cents worth of materials. Cut the four pieces of wood comprising the easel to size (if you wear shoes larger than a No. 11 make the easel about 3 in. higher than shown), and assemble by nailing the crosspiece to the top of the two front legs and attaching the back leg to this crosspiece with the hinge.

Now clip the hooks from the three hangers and fasten one, inverted, at the top of the easel, allowing it to project upward a couple of inches as shown. Two staples on each side hold it firmly. Next, wire the other two hangers together, ends overlapping, at the three points indicated. Measure your shoe length from the top of the easel, remembering to allow for the heel dimension of the lower row, and attach the two hangers at that height, across the legs of the easel. Use staples on the lower wire and cup hooks above. Clinch the cup hooks tightly around the wire with pliers. The cup hooks hold the upper wire, on which the heels hang, away from the easel legs—a gap just about the thickness of the average heel.—*Roland Cueva.*

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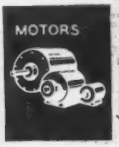

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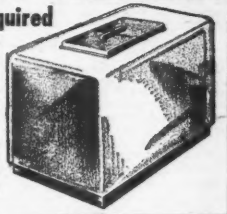

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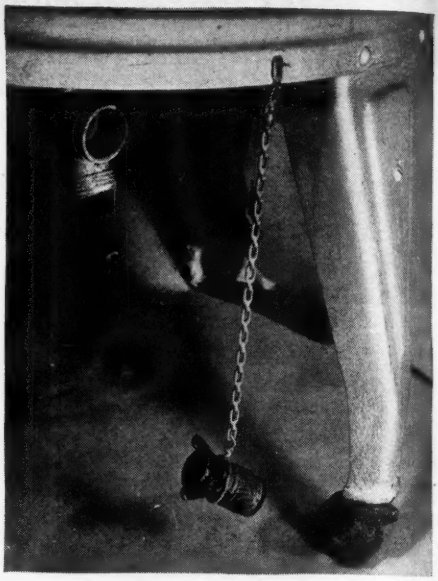
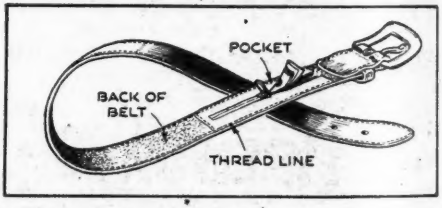


The drain plug of most washers is detachable and so is often mislaid or lost with resulting delays on laundry days. This condition may be eliminated by attaching the plug to the washer in a permanent manner as illustrated. The wire at the end of the chain must be loose enough so that the plug may turn inside the loop and yet tight enough so that the plug will not fall through. The free end of the chain is passed through a hole in the washer body and secured with a brass clip or cotter pin.

Secret Money Compartment



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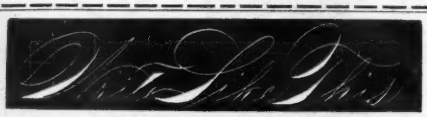

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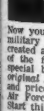

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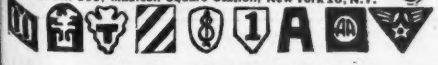

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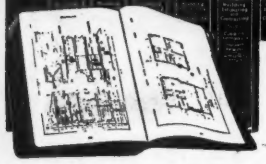

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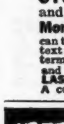

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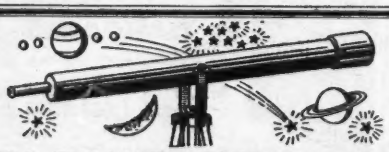

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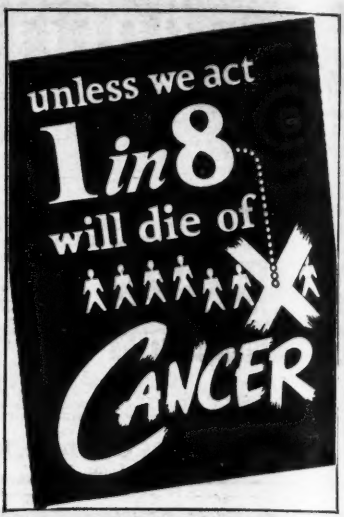

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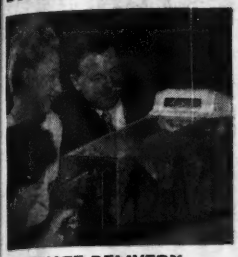

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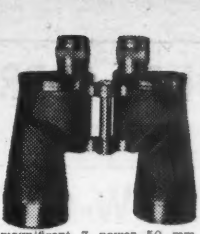

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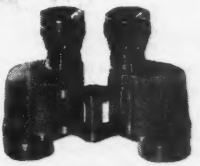

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SENTINELS OF THE SEA

Servicing 34,000 navigation aids—beacons, buoys, lights—is an unsung job of the U. S. Coast Guard.

ADVENTURE is the every-day fare of a hardy little band of Coast Guardsmen whose task is fostering the safety of life and property at sea.

Serving as traffic cops in America's busiest ocean highways, including the approaches to the harbors of New York, San Francisco and Boston, they maintain such vital aids to mariners as lighthouses, lightships, lighthouse tenders, radio beacons, fog signals, buoys and beacons.

The pay is small and the life lonely But these faithful men, who fight waves and treacherous rocks, seem always willing to take all manner of risks in the daily line of duty.

Drama may come swiftly. Not long ago a lightship was blasted from her station by a hurricane. All boats were lost; the master had three ribs broken. The mate brought the vessel to position using sail power alone.

The Coast Guard, through its 14 districts, now maintains more than 34,000 aids to marine navigation along the nation's 40,000 miles of seacoast, navigable rivers and the Great Lakes; in the waters of the Caribbean, the Hawaiian Islands and Alaska;

BY CAPTAIN C. H. PETERSON,

Chief, Aids to Navigation, Coast Guard,

as told to James Nevin Miller.

Above: The "Frankenstein" model foul weather mask with removable mouth and nose pieces.

and the approaches to the Panama Canal.

All navigation aids serve the same general purpose, the difference in placing a small, unlighted buoy, a lightship or a lighthouse being determined by requirements of the location. With aids placed along the nation's coast and navigable waterways as markers and guides, mariners are able to determine at all times their exact position.

For New York Harbor and its immediate approaches alone, more than 500 aids to navigation are now in operation, including 60 lights, two light vessels, 113 lighted buoys and 86 fog signals or sounding buoys. There are a number of small but substantial lighthouses in the bay, standing in the water on caisson or pier foundations. Those near the steamer track are Romer Shoal, West Bank and Robbins Reef.

Right: No faked picture this. Coast Guardsmen battle for their lives on the swamped decks of a loaded oil tanker engulfed by a hurricane.

Mechanix Illustrated

Ambrose Channel, the great cut through the shoals, 2,000 feet wide and 45 feet deep, leading into New York Harbor, is a wonderfully marked waterway. Indicating the immediate approach to the channel is first the Ambrose Lightship and then a great gas and whistle buoy with lights 28 feet above the water. Along the sides of the six miles of the channel are 18 lighted buoys and eight tall, unlighted buoys. On the starboard side entering the channel, the lights and the buoys are red; on the port side the lights are white and the buoys, black. The lights on the buoys at each end of the cut and at the turns are flashing; the others are fixed. It is possible for the largest steamer to pass in or out of the harbor day or night in any tide. Here indeed is proof of America's excellent system of safety aids to navigation.

It's rugged, working on the tenders that service buoys. Crewmen on these vessels must operate machinery that lifts 20-ton buoys, weighted down with several additional tons of chain and wet marine growth. Often they're covered with ice, too. It takes nerve to handle these giants and plant them at their sea stations or lift them onto the deck of a rolling repair ship.

Buoys are pretty elusive at times. A 12-tonner once broke loose from "home plate" on Nantucket Shoals off the coast of Boston. For 19 months it cruised all over the Atlantic and finally, after a 4,000 mile voyage, was picked up in the Gulf Stream just south of Florida. The buoy was little the worse for wear and at last reports was still on the job, doing daily battle with the elements.

Lightships mark the entrances to important harbors or dangerous shoals and also serve as leading marks for both oceanic and coastwise traffic. While on station a lightship shows only the masthead light and a less brilliant light on the forestay, the latter serving to indicate the direction in which the ship is heading. Since lightships ride to a single anchor, the light on the forestay also indicates the direction of the current. Lightships are maintained at 28 stations.

Above: Coast Guard Captain Peterson, author of article. His job is safety of life and property at sea.

The highest marine light maintained by the Coast Guard is an automatic one on Lehua Island, northwest of the Hawaiian Islands. It towers 709 feet above sea level. The tallest lighthouse tower is at Hog Island on the Virginia coast. Made of skeleton iron, it is 191 feet high. Two feet higher but no longer in use is the old Cape Hatteras Lighthouse. With a height of 171 feet, the Pensacola, Florida, lighthouse is the tallest brick tower now in use. •

Tending buoys is no soft touch. At right a crewman breaks the ice from a floating sentinel.

Tree Doctors

BY HENRY F. UNGER

Sometimes the trainee goes upside down, his rope carrying his weight. Good trick! In inset, the student is sawing off an undesirable limb.

Modern tree doctors really doctor trees — undergoing a rugged course to learn how.

HOLLYWOOD is pretty good at manufacturing Tarzans, but the Davey Tree Expert Co. is better. In four weeks of intensive tree-high training, Davey's turns out some of the most expert and sure-footed tree-hoppers in the world. And turns 'em out in batches.

The company takes young fellows between the ages of 18 and 26 and trains them to become full-fledged tree surgeons—but not any one can get in. First, the aspiring tree surgeon must send in an application accompanied by

a photo showing himself stripped to the waist—for only perfect physical specimens are wanted. He must not weigh less than 130 pounds and not be over six feet tall. Technical books on tree subjects must be digested, and an examination passed.

The successful applicants are called to the national headquarters in Kent, Ohio, in groups of 20. A company doctor examines them. Then, living in army-style barracks, with a foreman watching their every move, they are put through a daily ten-hour workout on the company's course.

The men are sent on long runs through the woods, to harden them. Lectures on various rope knots are given. They are shown how to lower branches via the rope route, how to send up tools in the shortest time. Although ladders will often be used later in their work, only muscle power, rope and ingenuity are used at the school.

Underground killer unearthed! Dr. S. W. Bromley, entomologist at the Bartlett School of Tree Surgery, points to the culprit—the four-inch grub of a root borer.

Gassing 'em, at Bartlett's. Former GI, protected by gas mask he first wore in Pacific, attacks root borer by shooting poison gas into his home grounds.

Trainees operate a cross-cut saw. The rope about the stub will catch it when severed, allowing it to be safely lowered by a man on the ground.

Class in tree surgery. Students are hard at work chipping out make-believe rotted portions of green logs, preparatory to inserting cement.

Students at Bartlett's watch as plant pathologist Nestor Caroselli demonstrates the technique of injecting anti-toxin for the cure of bleeding canker.

One by one the youths are asked to scale a high tree with only the use of a rope. Then, taught how to secure ropes around themselves to enable them to move safely, they learn to walk a waving limb.

Many youths prove high-shy, and it's often a problem to find them out. Alone, swaying in the wind in the branches of a high tree, they turn green, but back on the ground their fright usually vanishes.

The applicants are rarely allowed a chance to rest. When not tree walking they are learning the principles of feeding, spray-hose hoisting, cement filling, chipping out rotted portions, removal of fungus, and insertion of mechanical braces.

All but four of the photos show Davey trainees at their month of lessons. (The Bartlett course takes three years!) •

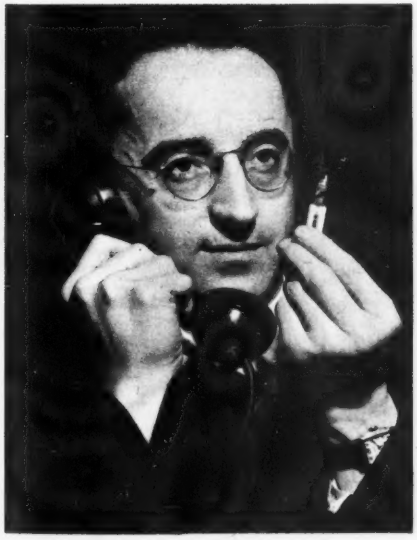
The threaded wood screws are holding the three branches of the old apple tree together, prolonging its age. The asphalt filling prevents decay.

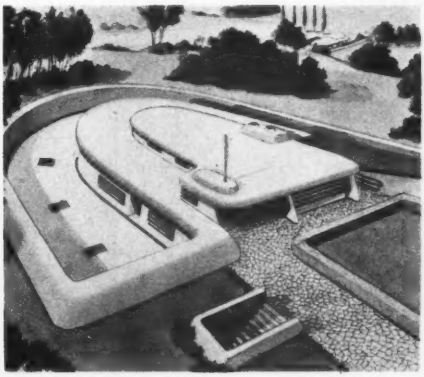
Here in all probability is the most-climbed tree in the world. It's 32 feet to the first limb, and all Davey men have to conquer it during their training.

Arctic Mask is a new costume worn by the Army Ground Forces in northern maneuvers. The white part is made of soft rubber. The lower portion contains metal wool which retains heat from expired breath and releases it to conserve body heat.

Tiny Transmitter fits into an empty lipstick container and is the world's smallest radio station. Below, Inventor Cledo Brunetti compares it in size with a telephone. Tiny batteries and microphone complete the unusual set.

It's In The Bag! Ginny Simms is shown above with the latest fashion accessory, the Handi-Brella, a combination shoulder bag and umbrella. Both are made of a white patent plastic. The set can be worn with or without the umbrella.

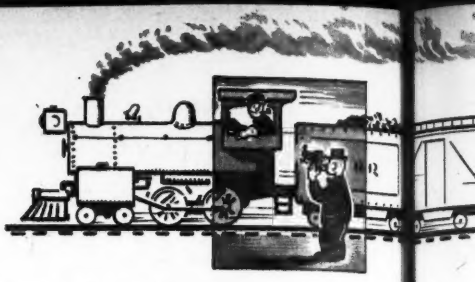




Atom Bomb-Proof dwelling shown above would have lead insulation against radiation and refractory cement to resist thousands of degrees of heat. Pole in center acts as an electric eye, sealing all entrances at the flash of an explosion.

One-Step Camera

revolution in photography



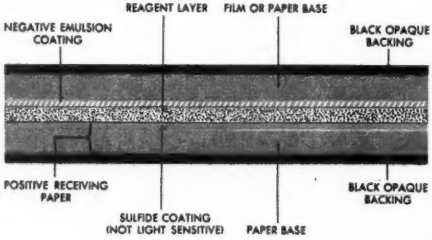
A finished photo, 60 seconds after you shoot it—with the Land one-step process.

WHEN the Edwin H. Land "one-step" process was demonstrated for the first time before a recent New York meeting of the Optical Society of America, it was billed as "a new kind of photography as revolutionary as the transition from wet plates to daylight loading film."

After attending a sober and unhurried repeat demonstration of the process by Mr. Land and his assistants at the Parker House in Boston, and analyzing the technical reports published since then, this writer considers the enthusiastic reaction of the daily press and the public fully justified.

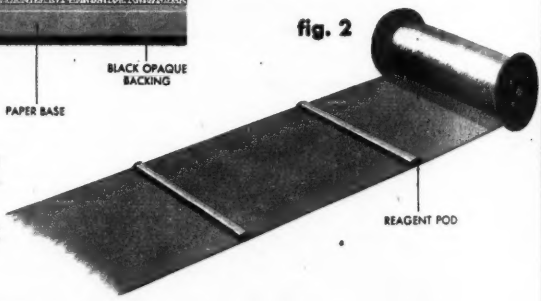
"Instantaneous photography" has been a

fig. 1



Left: Cross-section of negative-reagent-positive sandwich—while one-step print is being processed.

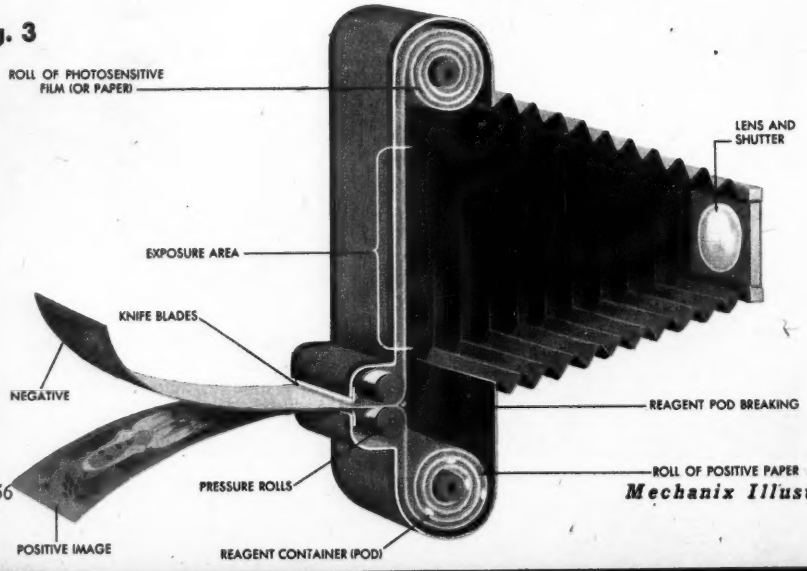
fig. 2

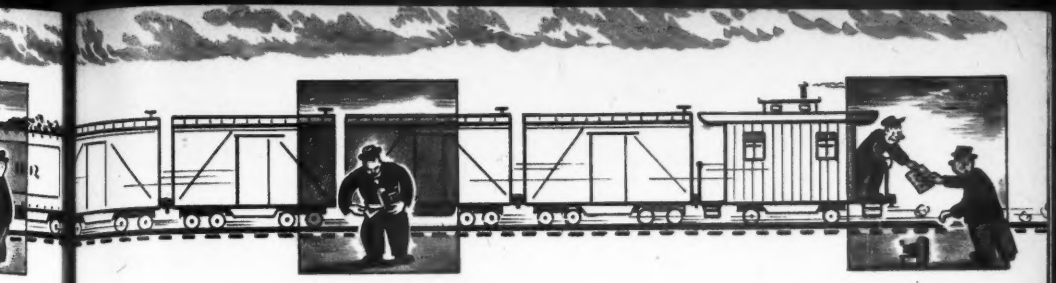


Right: How pod containing processing chemicals is attached to positive paper.

Below: Section of a typical camera designed for making "1-minute pictures."

fig. 3





BY NORMAN C. LIPTON

long-cherished dream of press photographers, newspaper editors and the millions and millions of amateurs who do 99% of their picture shooting around the house, at the beach or swimming hole, or on vacation trips. The Land one-step process should realize that dream within the foreseeable future.

Here's how a typical Land camera (Figure 3) works:

You snap the camera shutter and immediately turn the film advancing knob which forces a "sandwich" of negative and print material out through a slit at the back of the camera. After 40 to 50 secs., you tear the sandwich away from the camera and peel it apart. In one hand, you have a practically dry, finished print; and in the other, a discardable negative on paper base —only 60 seconds after snapping the shutter!

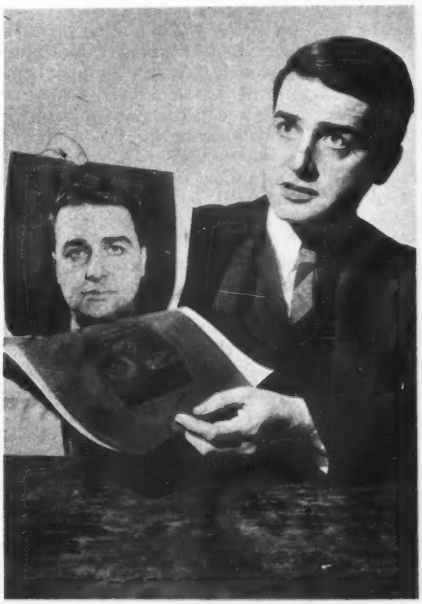
Duplicate prints are made by "copying" the original, print by the same process. No darkroom is needed for any phase of the process. It can all be done in daylight.

The above procedure, which was demonstrated in principle at the Optical Society meeting and at the Parker House press conference, is one of several quick photography processes devised by Mr. Land, who also developed the light-polarizing plastic, Polaroid. (He is president and research director of the Polaroid Corp., Cambridge, Mass.) In a simple variation of the foregoing procedure, ordinary rollfilm, producing a transparent, re-usable negative, may be used in place of paper negative material. The basic process uses a paper negative only because it costs about ¼ as much as an identical negative emulsion (Verichrome) coated on regular, transparent film base.

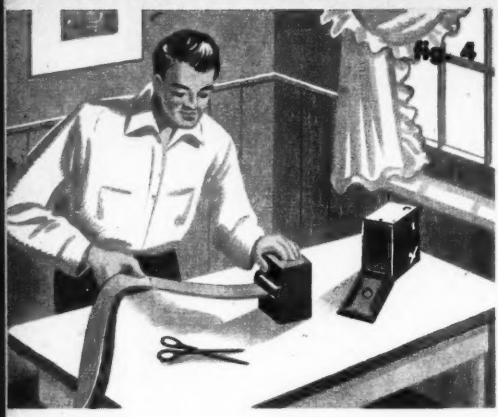
The first demonstration of "one-minute photography" took place just as it emerged from the research laboratory, and a commercial product can't reasonably be expected to turn up on the market tomorrow or next week. But, we do have the assurance of Polaroid Corp. officials that a camera employing one of the Land one-step processes is *now being designed for large scale production.* The cost and availability date will be announced "in the near-future."

Apparently, the commercial version of one-step photography is being aimed at the mass amateur market for 75% of amateur photo finishing today is for "first prints" only. However, we were assured that the needs of professionals and other specialized photographic workers would be taken care of in due time.

If you do not purchase a special "one-step camera" with a slit back and a pair of pressure rollers like the one illustrated in Figure 3, you should be able to equip any regular camera, having a removable



Right: Edwin H. Land, demonstrating one of his 1-step photography processes, peels apart a practically dry, finished print from (paper base) negative.



Home "darkroom" of the future—for ordinary roll-film negatives, exposed in conventional cameras. Merely load negative roll in light-tight box containing "receiving paper" roll, and equipped with pressure rollers and exit slit—like 1-step camera.

back, with a simple "one-step adapter" that includes the necessary features. At the formal demonstrations, an adapter for the Speed Graphic and another for a large view camera were shown, and used. Standard film packs are particularly suitable for the installation of the pressure rollers needed in the process.

Note, in Figure 3, that the roll of negative film or paper is placed where the film normally goes in regular rollfilm cameras, while the roll of "receiving" paper, on which the positive print image forms, is loaded in the take-up spool position. The receiving paper is coated with sodium sulfide crystals in strategically distributed clusters, and it is NOT light sensitive. All of the processing chemicals are contained in the thin, hermetically sealed reagent pod that runs across the width of the paper at the beginning of each frame length (Figure 2). As the exposed negative material and the corresponding frame of receiving paper begin to pass between the pair of pressure rollers, the pod is broken and the viscous liquid contained within it (consisting of hydroquinone, hypo, water, sodium hydroxide, sodium sulfite and a plastic—in a highly alkaline medium) rolls out in the form of a bead. In the resulting sandwich, which protrudes through the slit at the back of the camera, the reagent "solution" is spread out between the surfaces of the negative and print materials in a layer about .0001 inch thick. The sandwich is enclosed between the opaque backings of the negative and print materials (Figure 1) to prevent fogging by light.

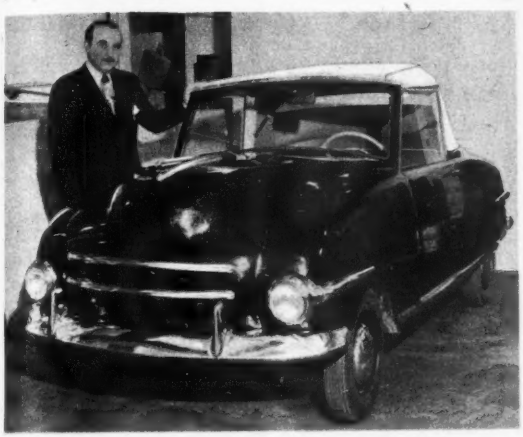
While the elements of the negative-reagent-positive sandwich remain together, hydroquinone diffuses from the reagent layer into the negative emulsion and rapidly reduces to metallic silver all the photo-sensitive silver halide particles that were exposed when the shutter was snapped. Hypo too diffuses from the reagent layer into the negative emulsion (at about the same rate) and combines with the silver ion of each silver halide particle that has not been affected by the exposure light. While the exposed silver remains in the negative emulsion, the silver from the unexposed particles, chemically bonded with the hypo, travels quickly into the reagent layer where hydroquinone develops it into metallic silver. (This frees it from the hypo, which can return to the negative emulsion for more unexposed silver ions.) The metallic silver is then quickly deposited on the surface of the receiving paper to form the shadows and half-tones of the positive print image—by means of a physical action involving the sodium sulfide crystals on the paper surface. Thus, the unexposed silver particles that are not needed in the formation of the negative image are fully utilized in the making of the positive print.

The temperature tolerance of the one-step process, above, was engineered to produce uniform print quality over a range extending from 30 to 100 degrees F., with the suggestion that the sandwich be peeled after 90 seconds of contact (instead of 40-50 seconds) at lower temperature extremes; and after 30 seconds at higher temperatures. At average operating temperatures, varying the peeling time between 30 and 90 seconds was said to vary print contrast over a range of two grades of negative-to-positive printing paper.

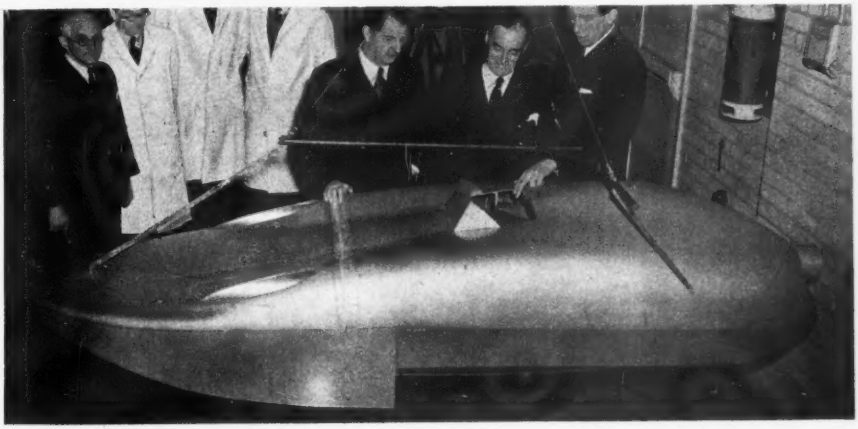
Contrast can also be controlled by using different negative emulsions, receiving paper and chemical reagents (in the pod).

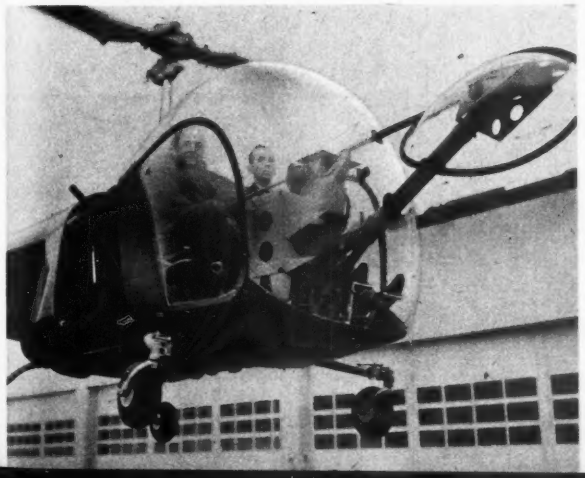
The quality of one-step prints turned out at the Boston demonstration as well as older prints exhibited there seemed uniformly good. Whites were clear; half-tones were well separated, and deepest blacks and chocolate browns (where warmer tones were produced purposely, by varying the reagent pod contents) seemed rich. Although the quality fell short of professional illustrators' and advanced pictorialists' standards, it was superior to the general run of commercial photo-finishing. In explaining the streakiness evident in most of the larger (8x10-inch) prints, Mr. Land stated that this fault was due to uneven machine-coating of the receiving paper, and was not a result of uneven spreading of the viscous reagent by the pressure rollers. Smaller one-step prints made on [*Continued on page* 162]

100-MPH Racing Model is held at right by Peggy Dexter of Chicago. The racer, as well as the speed boat on the table, are powered by pulse jets. The tail pipe on the car measures 28½ inches.



Buffalo Bid for the midget car market is the 1948 "Playboy" at left. Made in Buffalo, N. Y., it has a 60-mph speed and goes 40 per gallon.





Bluebird II in model form above is inspected by Sir Malcolm Campbell (nearest cockpit) at Middlesex, England. The craft will be powered by a Goblin II Gas Turbine Engine.

Miners will use a helicopter in place of the old-time prospector's pick and shovel. As the craft hovers, the magnetic device in front does all the work of locating ore deposits.

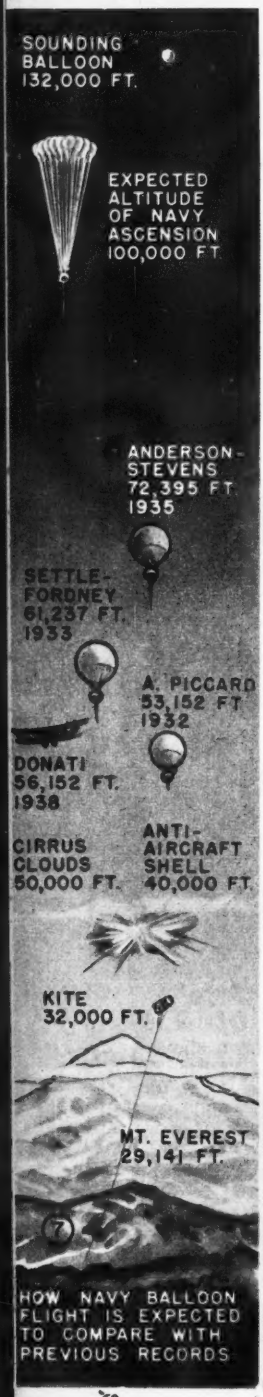
UP GOES PICCARD!

Scientist Piccard is preparing to climb to 100,000 feet on a bunch of balloons.

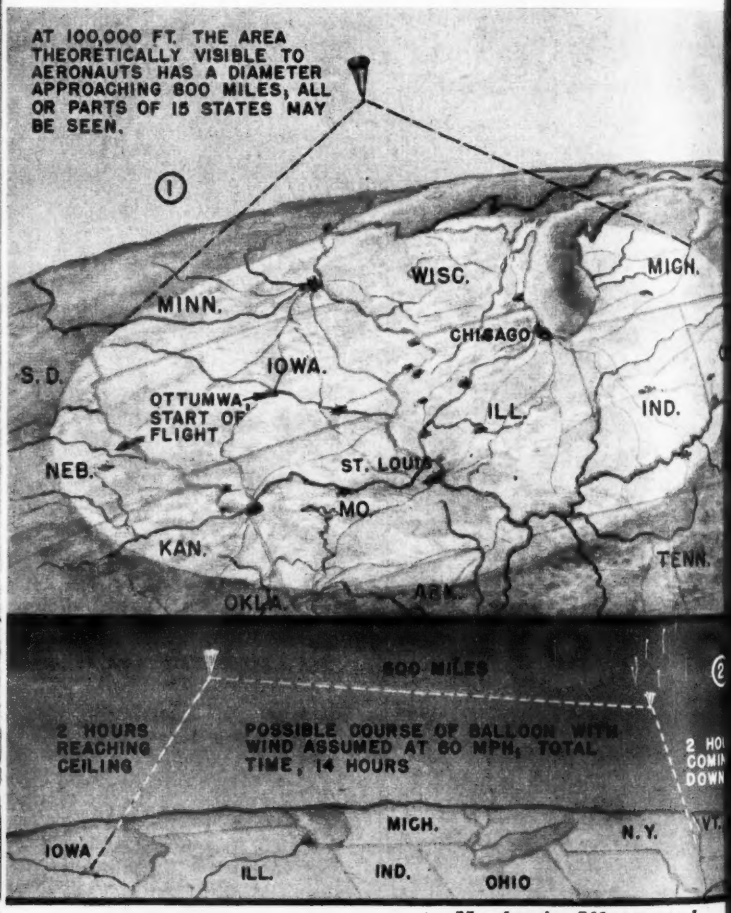
BY LOGAN U. REAVIS

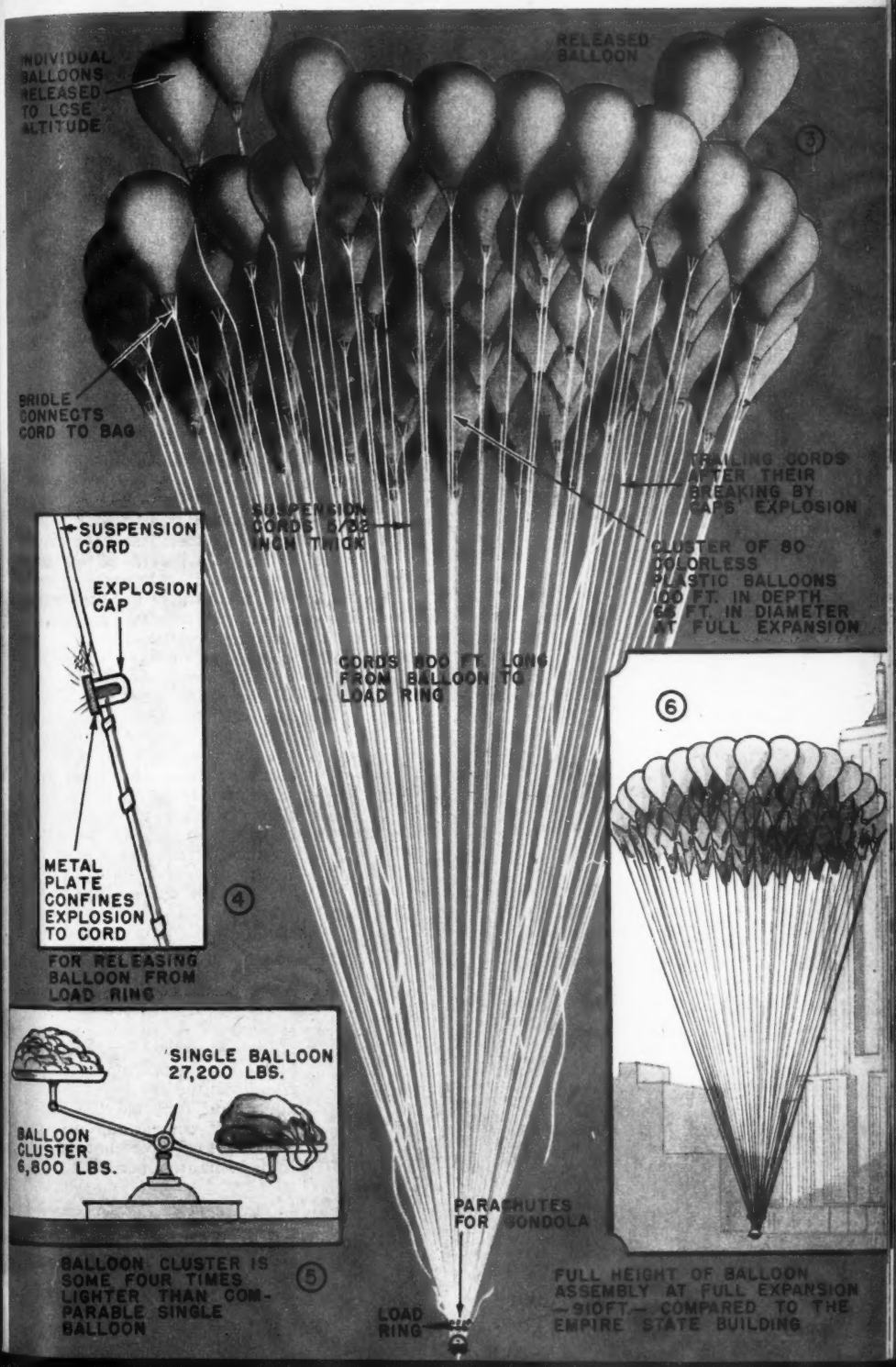
THE U. S. Navy, in collaboration with 21 of the country's leading scientists, is laying plans to send a "sky-laboratory" to a record altitude of 100,000 feet.

The sky-lab, a seven-foot aluminum sphere to be carried aloft by a cluster of balloons, will be jam-packed with instruments, and manned by the well-known physicist Dr. Jean Piccard and a Navy pilot.



HOW NAVY BALLOON FLIGHT IS EXPECTED TO COMPARE WITH PREVIOUS RECORDS




INDIVIDUAL BALLOONS RELEASED TO LOSE ALTITUDE
RELEASED BALLOON
3
BRIDLE CONNECTS CORD TO BAG
TRAILING CORDS AFTER THEIR BREAKING BY CAPS' EXPLOSION
SUSPENSION CORDS 5/32 INCH THICK
CLUSTER OF 80 COLORLESS PLASTIC BALLOONS 100 FT. IN DEPTH 65 FT. IN DIAMETER AT FULL EXPANSION
CORDS 800 FT. LONG FROM BALLOON TO LOAD RING
SUSPENSION CORD
EXPLOSION CAP
METAL PLATE CONFINES EXPLOSION TO CORD
4
FOR RELEASING BALLOON FROM LOAD RING
6
SINGLE BALLOON 27,200 LBS.
BALLOON CLUSTER 6,800 LBS.
5
BALLOON CLUSTER IS SOME FOUR TIMES LIGHTER THAN COMPARABLE SINGLE BALLOON
PARACHUTES FOR GONDOLA
LOAD RING
FULL HEIGHT OF BALLOON ASSEMBLY AT FULL EXPANSION —910FT.— COMPARED TO THE EMPIRE STATE BUILDING

Dr. Jean Piccard (left) at work on a mock-up of the gondola in which important new scientific data will be sought 19 miles above the surface of earth.

When, early some fair morning, helium begins streaming into an odd assembly of bags ringing the gondola at the Naval Air Station at Ottumwa, Iowa, finis will be written to the long succession of heavy single gas bag balloons man has used in his effort to rise above the earth. There, for the first time, a cluster of light-weight bags will be employed. And a plastic instead of rubber material will be used, as less liable to burn, rupture and suffer from abrasion.

The many balloons give an improved means of losing altitude. Instead of "valving" away the gas or rupturing the bag itself, as in previous balloons, the cluster arrangement allows simple release of entire units. Detachment is effected by means of an explosive cap affixed to each cord. The cap is covered by a protective casing to prevent premature trouble, and is detonated by a wire leading from the gondola. The balloon and attached piece of cord float away, later to explode as the enclosed gas bursts its covering in the far upper regions. In the final descent enough bags are liberated to permit an easy landing. If the cluster acts like a parachute, bringing danger of dragging along the ground—as it may—all the remaining balloons may be released.

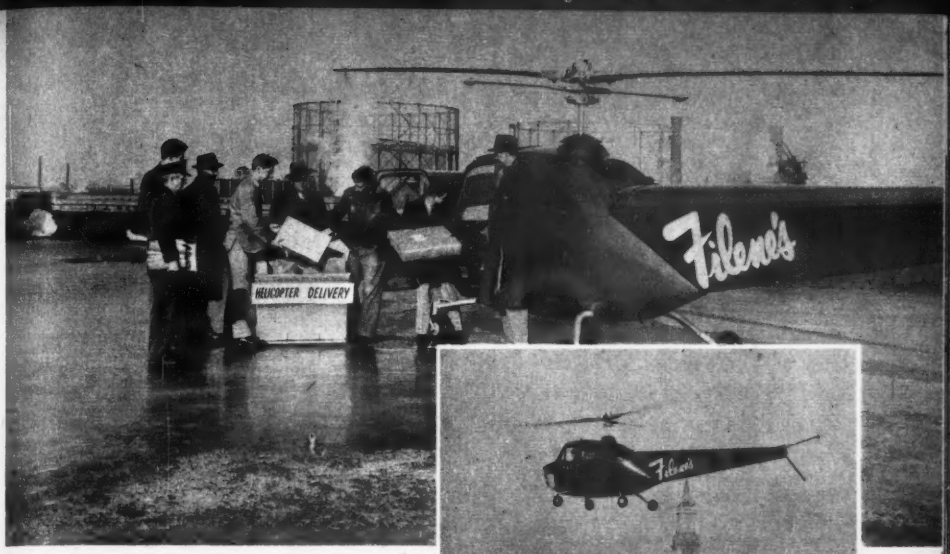
Should the aeronauts feel disposed at any time to accelerate their rise, they may drop some of the 1,280 pounds of ballast which will be carried.

The course of the strange aerostat will be followed by immense numbers of radios, theodolites, and other instruments.

The flight is expected to obtain valuable data on light, temperature, sound and the mysterious cosmic rays. The long drift through the upper air will afford an opportunity for sustained study of the reaction of the instruments to feeble but perhaps extremely important radiations. (Rockets and sounding balloons are unable to give anything like a continuous record at uniform altitudes.) The gondola will be free from vibrations. The steady reaction of the instruments may well catch the first telltale indications of dangers which must be faced by the first voyagers into interplanetary space.

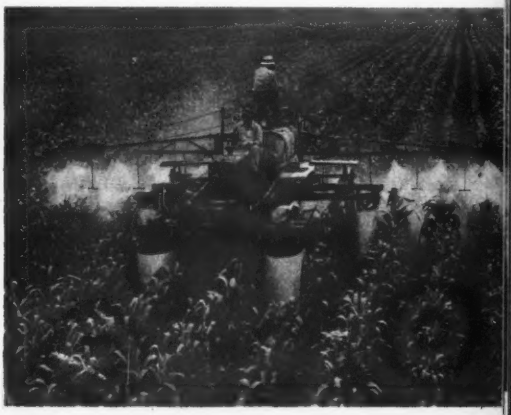
The Russians sent up a high-altitude balloon in 1945 which drifted 500 miles in 17 hours and reported the discovery of cosmic ray action with the explosive characteristics of an atom bomb! ●

Dr. Piccard, holding a thermometer of his own special design, stands with his wife before a sketch of the revolutionary cluster balloon.

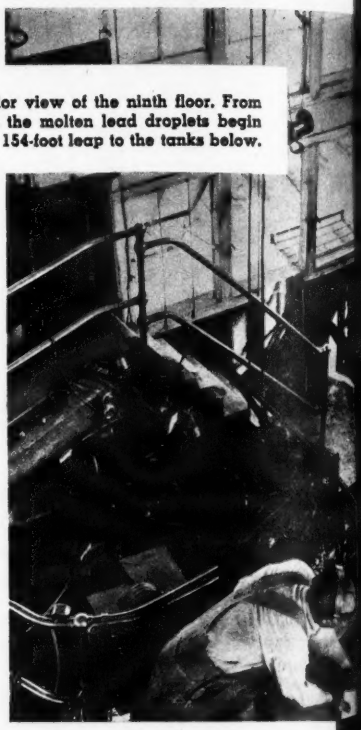


Rooftop Delivery became an actual fact when William Filene's Sons Company of Boston began the helicopter service illustrated here. Above, the 'copter is loaded on the roof of Filene's Cambridge warehouse and, right, it hovers over the South Boston Postal Annex. Postmaster Connelly was on hand to greet it.

Two-Way Radio demonstrated at left by Lois Lamont of Chicago is designed for use on construction projects or in areas where telephone service is not convenient. The set is called the "Citizen's Radio" and has a range of seven miles.



Corn Gets DDT in one of the first large-scale experiments to exterminate the costly corn borer pest. At right, a special tractor, equipped with high seats to keep the operators above the fumes, sprays the fields of Lester Phister, El Paso, Ill.



Interior view of the ninth floor. From here, the molten lead droplets begin their 154-foot leap to the tanks below.

Above: This dropping pan, for No. 6 shot, contains 2,400 holes. Perforations separate melted lead into droplets.

LEAD shot for shot gun shells is probably the only product of industry made on a vertical production line. To learn what goes on inside a shot tower, we made a tour of the Winchester plant pictured here.

Manufacture begins in a melting pot on the ninth floor of the tower where the molten metal flows from the pot through two pipes into the perforated dropping pan. As the lead works its way through the holes in the pan, it becomes droplets which immediately plunge down the nine stories—154 feet—into a water tank which absorbs the shock of the fall and enables the droplets to maintain the spherical shape they have assumed.

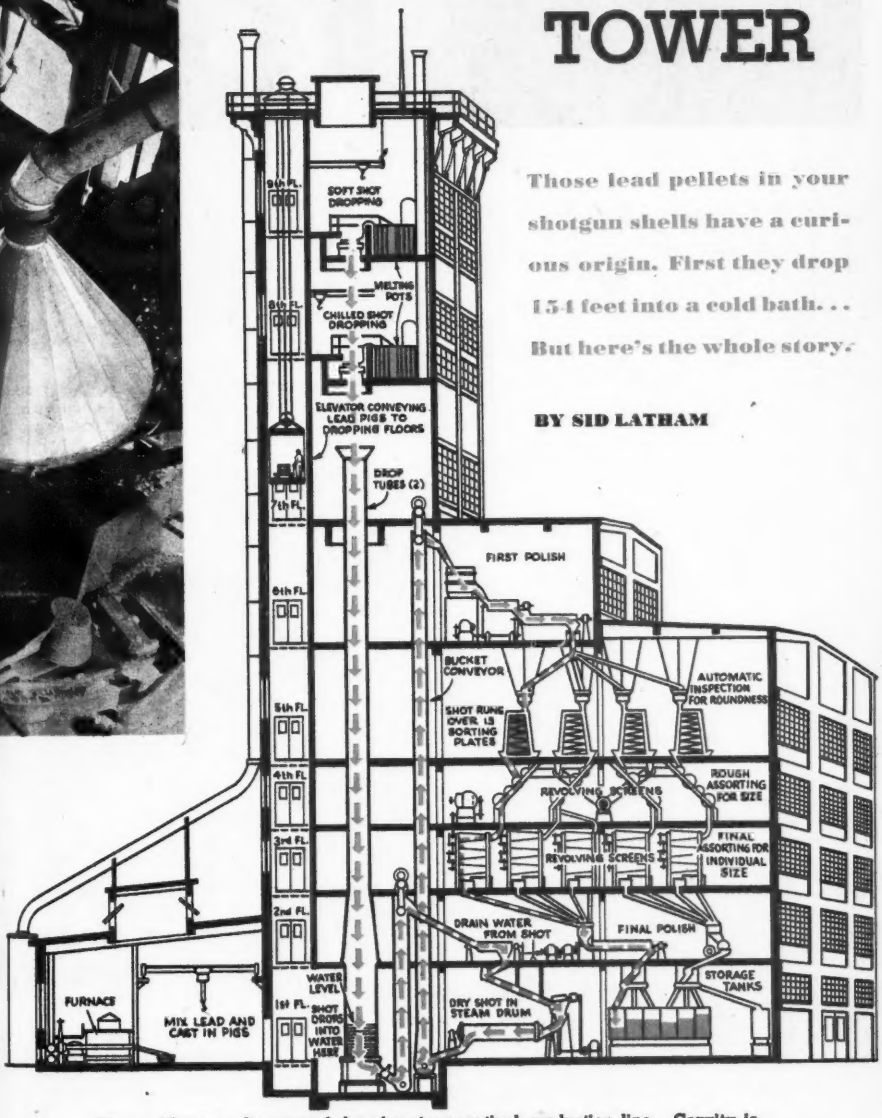
Sinking into a trap, the lead shot is removed from the water by a continuous bucket conveyor and run through huge drying

Right: The start of the plunge. Each drop will be spherical by the time it hits bottom. See diagram, next page.

INSIDE A SHOT TOWER

Those lead pellets in your shotgun shells have a curious origin. First they drop 154 feet into a cold bath. . . But here's the whole story.

BY SID LATHAM

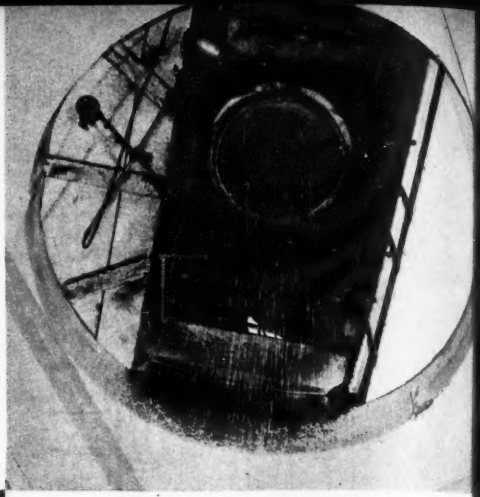


Above: Phantom diagram of the nine-story vertical production line. Gravity is the principal force of energy. The big drop makes each shot spherical, then the leaden balls are rolled through a maze of assorting and polishing devices.

drums. The bucket conveyor next carries the shot to the sixth floor, where it is put through a graphite drum for polishing.

Descending to the fifth floor, an ingenious arrangement of sloping glass tables separates the perfect and imperfect shot.

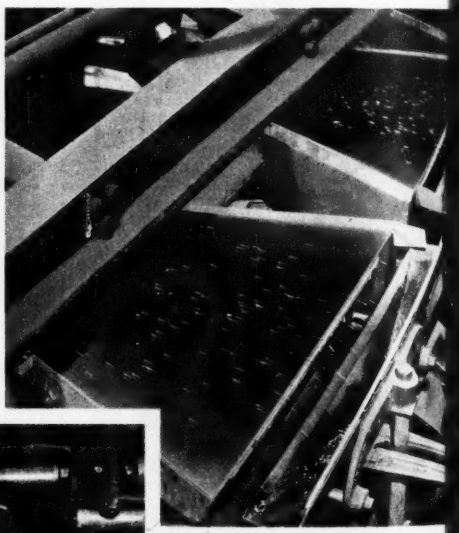
Circular screens on the fourth and third floors eventually sift the shot to correct sizes. Dropping next to the second floor of the shot tower, the now perfect pellets are weighed, put through a revolving drum for their final polish, and lowered by chute to storage tanks, from where they are eventually taken to the company's loading division. •

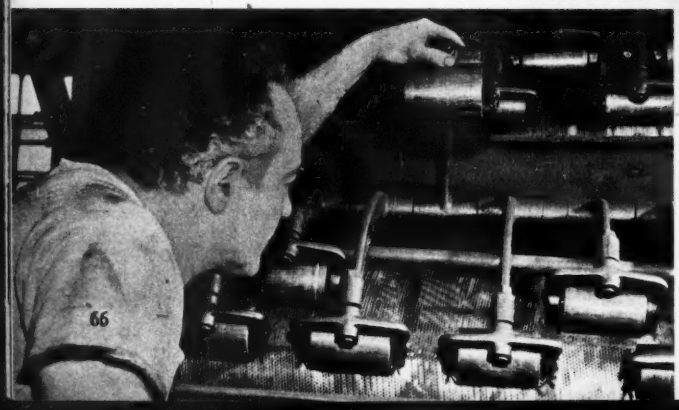


Above: Looking upward at bottom of the dropping pan. Five tons of lead—35,000,000 shot—come down from this one small pan every hour.

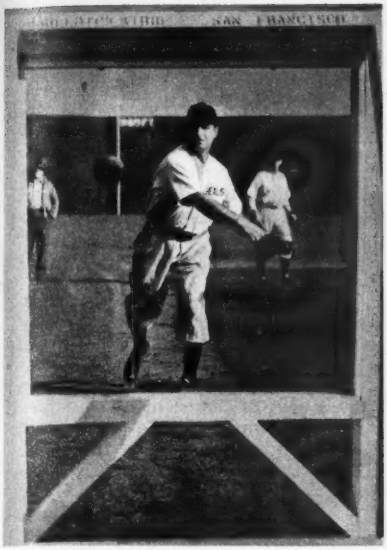
Above: Stanley Mayer, in charge of production, checks the shot for size as it goes down the chute from water tank to drier.

Below: Gravity does the separating job, too. It gives the round pellets enough momentum to leap the waste trough; off-shape ones fall in.

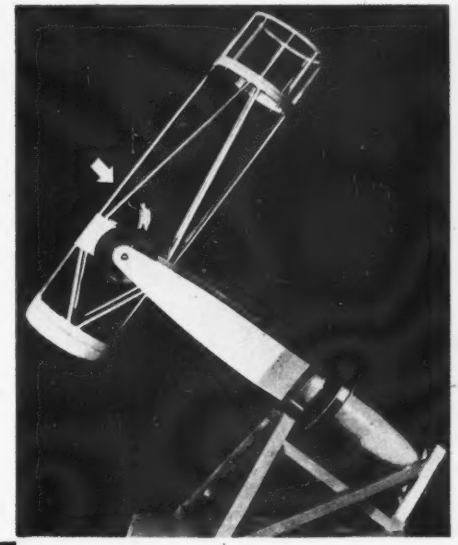




Left: Screens sift the shot into various sizes. Wooden rollers prevent pellets from clogging.



Tempered Glass Screen for grandstands in ball parks gives perfect visibility and protection too, as demonstrated at left by Pitcher Bob Joyce of the San Francisco Seals. Attempts to break the half-inch thick plate glass with baseballs proved futile.



900,000,000 light years into space will be the range of Lick Observatory's 120-inch telescope shown in model form at right. Figure of a man is reduced to same scale as telescope.

Bottle Holder is a handy device at feeding time. It was invented by N. W. Guden, left, of Chicago, shortly after he became a grandfather. The plastic bottle helps to keep milk warm.

$1,000 Flit Gun unleashes a blizzard of oil, water and dust into a mosquito breeding ground near Miami, Fla. The killing fluid is shot out from a turbine sprayer effective in a 200-foot radius.

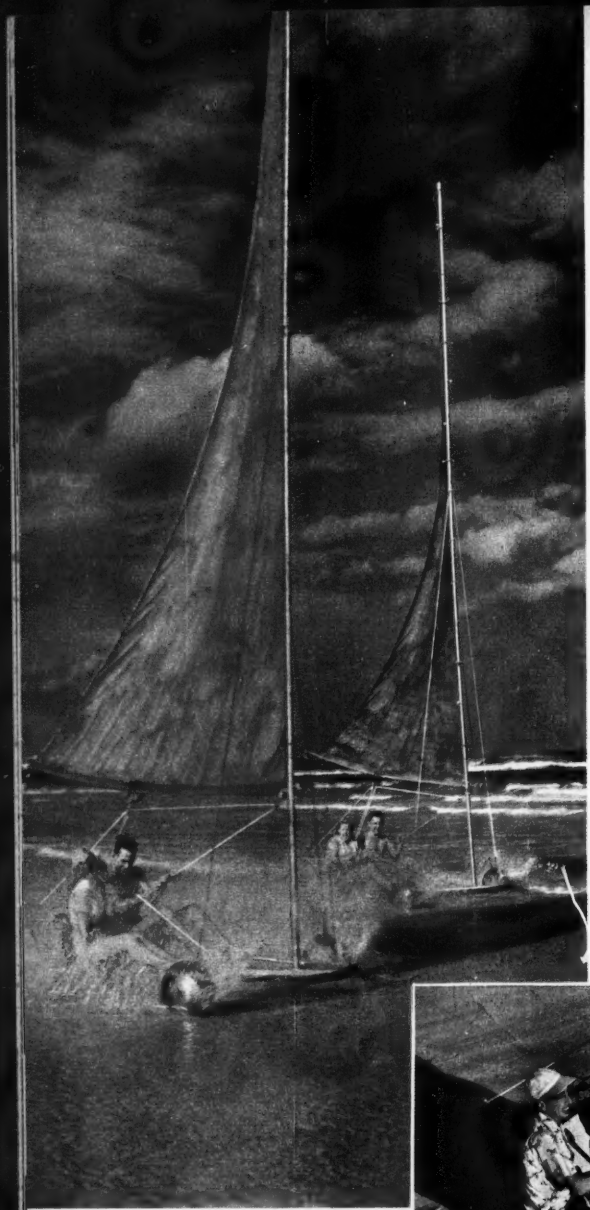
sand sailer

YOU can skim down the beach at 20 or 30 miles an hour—maybe on up to 40 or 50 if you're an expert and the wind is right. (The record is 74 mph in a 25-mile wind.) And when you're sitting one foot above the sand and the wind is whistling down your mains'l, you don't need a speedometer to know you're moving, and fast.

Sand sailing—except for the greater speed—is much like sailing in the water. The tiller turns the rear wheel which corresponds to the rudder. The boom swings around—well above the riders' heads—when the boat comes about.

The sport, we are told, is not new. Even back in 1800, wind-propelled vehicles were a common sight in the low countries in Europe. They were first seen in the United States, some time before the war, on the hard beaches of Sea Island, Georgia.

Two brothers are responsible for the recent leap to popularity of sand sailing. Shortly after their discharge from the U. S. Coast Guard in June, 1945, John and Lawrence Ely, of Daytona Beach, Fla., built five Sand Sailers (they've copyrighted the name) and put them in at Sea Island.



Above: These dry land mariners cut into the surf for a refreshing spray. Sand Sailers steer and tack just like sail boats.

Right: He mans the tiller while she trims the 130 square-foot sail. The 7 by 10 foot frame is constructed of ¾-inch tubing.

Below: Sail can be shortened by turning the roller boom and securing in desired position.

The tailwheel or "rudder" is steered by a rod from tiller as shown in this underside view.

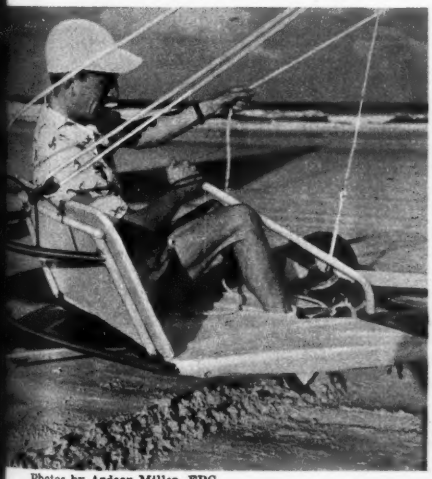
That fall, they built fifteen more which have been in use at Daytona Beach ever since. The brothers predict that sand sailing will become a national sport.

Though John and Lawrence have been sailers all their lives, they say their experience in the service has been a great help in their present enterprise. They served aboard sailing vessels which went out on anti-submarine patrol in the North Atlantic steamer lanes. John was a first mate and Lawrence was a skipper.

They built their first Sand Sailer with an adjustable frame and after many experiments to decide just how wide apart the wheels should be they settled on a permanent design.

The brake is a steel rod which you press into the sand with your foot. The frame is constructed of ¾-inch steel tubing and is seven feet wide by ten feet long. The boom is twelve feet long, the mast is 30 feet high and the sail covers 130 square feet. •

Below: The brake is a ¾-inch steel "plow" hinged to frame and applied by foot pressure.



The trim sheet has a 3 to 1 purchase; roller jaw is big enough to hold sail when reefed.

Photos by Ardean Miller, FPC

"fly" fishing

Every fisherman knows that the big ones are in the next lake—so why not fly right after 'em, canoe and all?

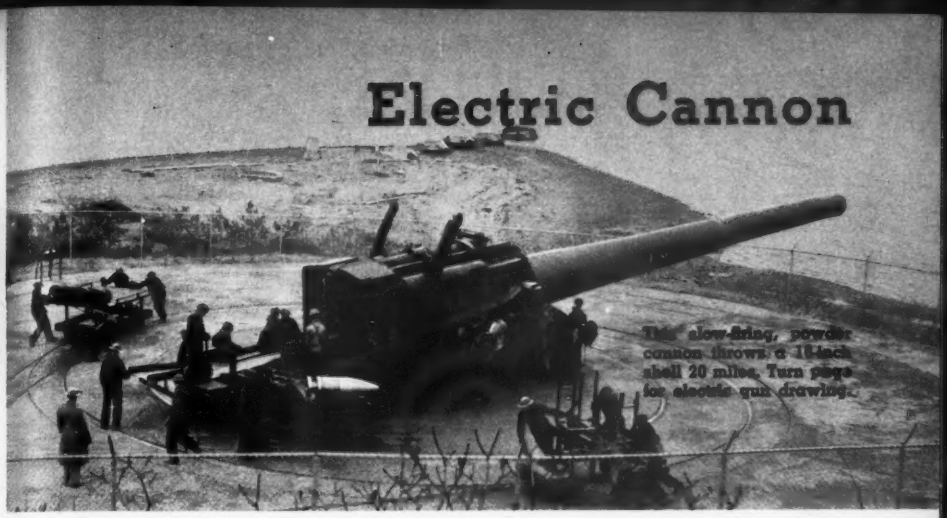
This is much better than carrying the canoe from lake to lake, as the Indians used to do. The plane has set down on that next lake; it's practically beached; so it's easy to unfasten the canoe and slide it to shore.

Beware, you fish in the next lake! The threesome in the plane above, flying from Moosehead Lake, bring lures most fascinating—and intentions most evil.

One of Maine's camps with seaplane service is at Lily Bay, on Moosehead Lake. Fishing's fine right there—if you can forget that next lake. Still, John and Pat are doing all right. They're having fish for lunch.

They proudly show their pilot and guide the big one. In their absence he's kept the fire going and checked the plane, and now he shows his admiration and hears—five times—about the still bigger one that got away.

Electric Cannon



This slow-firing, powder cannon throws a 16-inch shell 20 miles. Turn page for electric gun drawing.

BY WILLY LEY

Rapid rate of fire—one shell per second—may be possible with electric propulsion.

NOT long after Pearl Harbor several popular magazines published in Germany and in German-dominated France began to carry articles about a wonderful new German weapon. It was said that German engineers had developed a new type of long-range gun, capable of firing a distance of 125 miles *at the rate of one shell every second.* The secret of such fantastic performance, it was explained, was that these long-range guns did not use powder to propel their projectiles, but electric current.

From the fact that these articles appeared during the war several possible conclusions could be drawn. One was to take the articles at face value, but that did not jibe well with the habits of military security. Another and more likely conclusion was that the Germans actually had such plans, but that for some reason they had given up. And while it did not make a weapon, it made good propaganda.

U. S. Army reports, recently released, prove that the second conclusion was correct. The Germans did work on electric artillery experimentally as well as theoretically. So did the Japanese. But neither was able to carry research and experimentation to a useful conclusion.

The idea of the electric gun is not a novelty by any means. There are quite a number of patents on electric guns (most of them German) and a number of inventors have actually constructed experimental models.

Most famous of the electric gun inventors was probably Dr. E. F. Northrup, inventor of the Ajax-Northrup high frequency induction furnace which is in use all over the world. Dr. Northrup was interested in electric guns mostly for the purpose of using them to launch large-size rockets—another idea which military investigators found marked down in the notebooks of the Nazi scientists.

An electric gun does not have a real barrel; its "barrel" is a series of coils, wound around an empty space in the middle. They are technically known as solenoids. In practice and under heavy electric loads, Dr. Northrup found, wire coils heat up too fast and too much. For this reason he began to use hollow copper tubing instead of solid copper wire. Cold water, kept circulating through the tubes, prevented dangerous heating even under heavy loads.

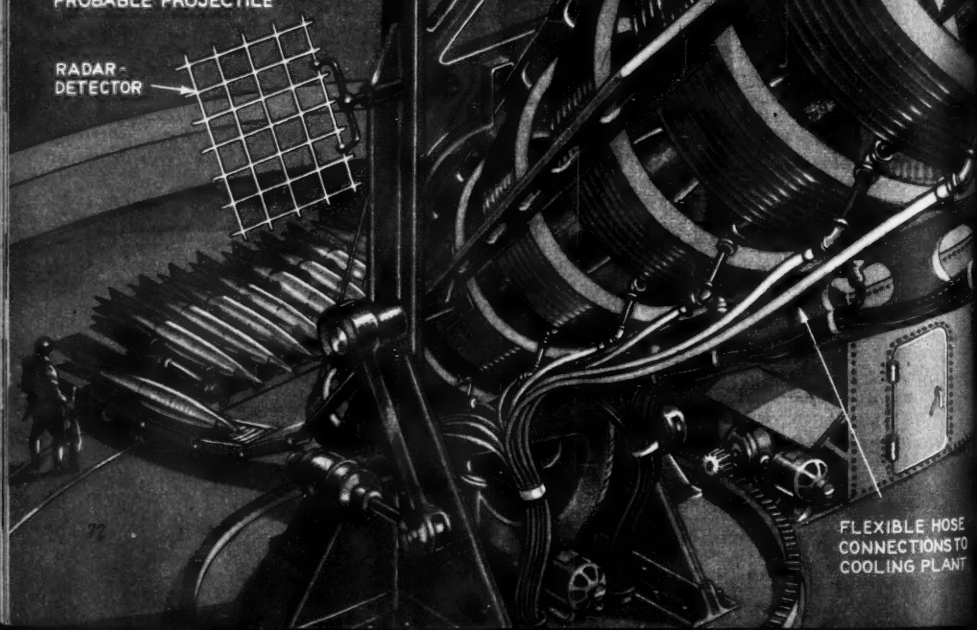
If an electric current is sent through the coils and a metal object inserted into the coil the object will show an induced current. That in itself might not do more than just hold the object rather rigidly in the center of the coil. But if you have a long barrel built up of coils and send, let us say, a three-phase current through the series of coils, a curious thing will happen. The "wave" of current sweeping through the coils will want to pull the object along. It will succeed the better, the more powerful it is and the longer the series of coils. When the object arrives at the other end of the tube it will keep on going, since there is nothing to stop the momentum acquired inside the tube. Nothing, that is, except air resistance and the action of gravity, but these two need time to work.

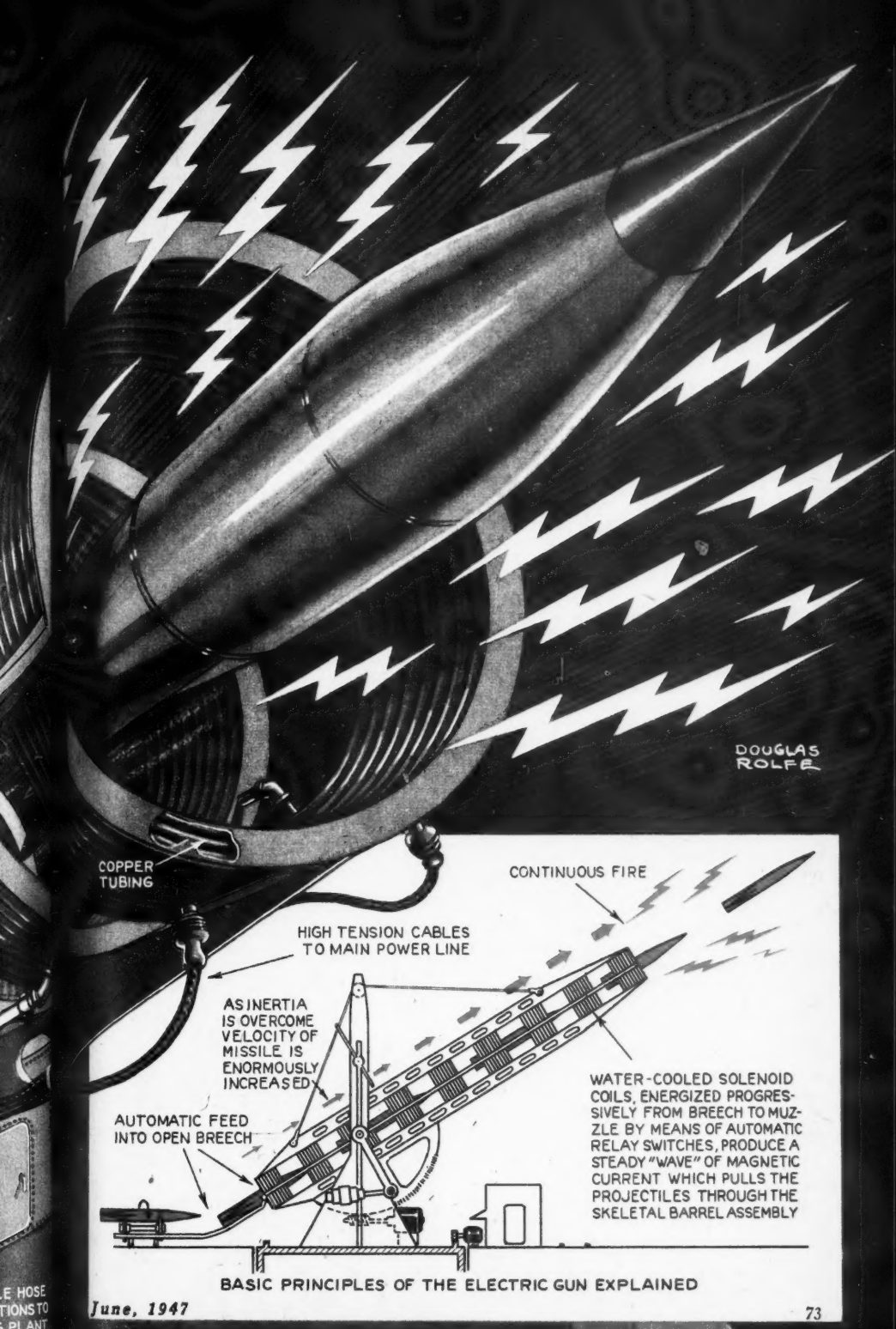
I say "object" because it does not need

SECTIONAL VIEW OF PROBABLE PROJECTILE

to be a bullet or even have the shape of a bullet. But the proper shape, of course, is that of a projectile because it overcomes air resistance best. Since there is no way of making it spin, it would have to be fin-stabilized.

The advantages of such a scheme are great. But so are the disadvantages. The main advantages are these: since an electric gun does not need a breech-block mechanism and since the interplay of electric forces inside the gun carries the projectiles away about as fast as they can be fed in, the rate of fire can be tremendous. The shells could literally be fed in by means of a moving belt. The other major advantage is that an electric gun can produce a much higher muzzle velocity than a powder gun. There is a limit to the pressures which gunpowder can produce in a gun barrel. [*Continued on page* 164]





BASIC PRINCIPLES OF THE ELECTRIC GUN EXPLAINED

Electrons...

BY JOHN C. ADLER

Electrons, tightly controlled, speed through magnetic lenses to make pictures of once-impenetrable secrets.

THE electron microscope, which searches with electrons instead of light rays, has given medical and industrial scientists a chance to peer deeply into hidden worlds. With it they are solving knotty problems of the basic structure of synthetic rubber, of plastics, of high-speed photographic films; they are learning why metals suddenly "get tired," why face powders won't smooth out on the face, why printing inks won't behave, and why many industrial processes don't go the way they're supposed to go.

Most dramatic, perhaps, medical scientists at long last can see the viruses which cause so many dread diseases, can watch the battle between antibodies and bacteria, can observe the fighting technique of such chemical germ killers as penicillin and the strange workings of that temperamental enemy of the microbe, bacteriophage. A new era is at hand for both the perfection of many products and a sure and certain attack upon much of the disease before which medicine was helpless before.

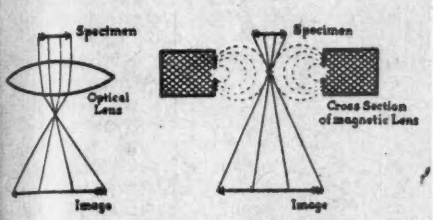
This writer has just paid a visit to the R.C.A. Victor plant in Camden, N. J., where the electron microscope is manufactured. I spent half a day with M. C. Banca and Harvey B. Merrill, Jr., of the scientific instrument sales department. I asked them, "How does this machine work, and why is it one hundred times more powerful than a light microscope?"

They told me that a beam of electrons, shot out of a glowing wire, is first passed through the field of a powerful electromagnet. This is the "condenser lens"; it brings the electron stream to a focus, just as the glass condenser lens of a light microscope brings the rays of light to a focus. The beam then passes through the object to be studied, through another magnetic

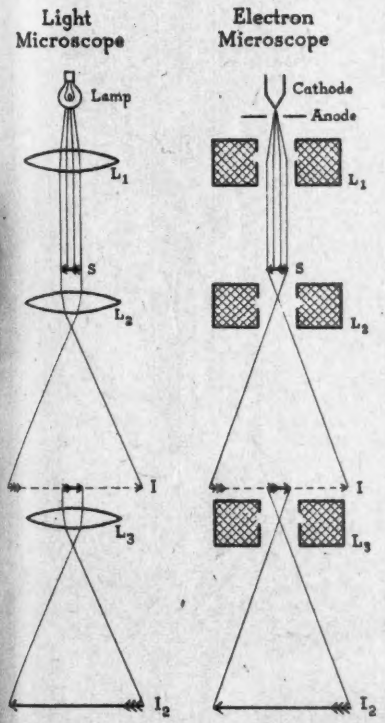
Many a baffling food problem is answered by the electron microscope. Above, a specimen of chocolate is being placed in the viewing chamber.

There is a blur. The dials are adjusted further. The image comes to focus, tremendously magnified. If it's desired, pictures may be taken.

...FOR A MICROSCOPE



Cross-section view above shows how the field (dotted lines) of a donut-shaped magnetic coil is used to bend the paths of the electrons, bringing them to a focus and causing the projected image of the specimen to be enlarged in exactly the same way an optical lens treats a beam of light.



field, the "objective lens," which magnifies it. A primary image is formed, which in turn passes through a third magnetic field, the "projector lens," and falls upon a fluorescent screen similar to that used in a television receiver. It is upon this fluorescent screen that the tremendously magnified object is viewed by the observer. Should the observer wish to take a photograph, the fluorescent screen is lifted away and the electron beam allowed to strike a photographic plate. The picture itself can then be enlarged to give a sharp, clear image as much as 200,000 times the size of the original object.

This magnification by the use of electrons is much greater than the possible magnification by light because the wavelength of an electron is about one one hundred thousandth the wavelength of light. The relatively large wavelength of light has determined the limit of light microscopes. An effective magnification of 2,000-3,000 times was the best that could be gotten using visible or even ultra-violet light.

But when, in 1927, physicists proved that electrons have a wave motion and could consequently be brought to a focus, scientists knew that it was only a matter of time and research until they could harness them for use in searching out the world of the infinitely small. They learned to use magnetic and electrostatic fields of force instead of glass lenses, and finally built the super-microscope.

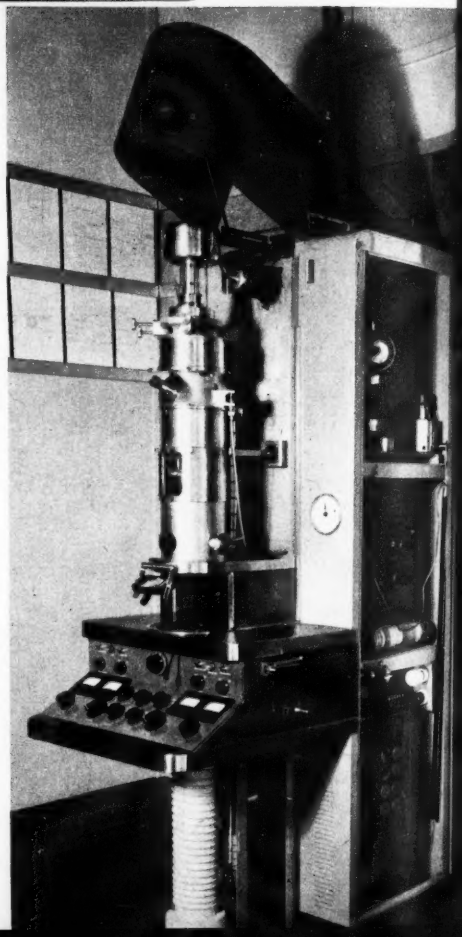
There are difficulties, however. The electrons must move inside a near-absolute vacuum, because if they should collide with molecules of air they would bounce off course. Control of the electromagnets must be exact, because the tiniest aberration of current would send the electrons into gyrations which would prevent proper focus. The assembly must be proof against vibration and outside interference. In other words, everything must be handled with the slickest of kid gloves.

R.C.A. Victor has solved most of these problems. It has developed a system of air

The magnetic lenses of the electron microscope are the same in arrangement and function as the optical lenses in the light microscope, but they are not moved. Focusing is done by varying the current flowing in the coils. This varies the intensity of the field acting on the electrons.

Left, the console type of electron microscope. Note the simplicity of the control panel and the convenient location of the viewing screen.

Below, universal type of electron microscope, with door and hood open to show accessibility. (Much bulk to expose a little of the little!)



locks, much like the air locks of a submarine escape-valve, through which specimens are inserted and photographic films are placed beneath the beam. It has designed a housing so ingenious and sturdy that vibrations and outside disturbances are completely absorbed. It has devised electric circuits so delicate and maneuverable that the operator can control the machine almost as easily as tuning a radio set.

I asked a number of questions.

Has the molecule been seen? Perhaps. A picture of polymerized vinylchloride, one of the synthetic rubbers, at top magnification, shows a series of dots which are possibly the molecules making up its basic structure. But the scientists are very cautious in jumping to this tempting conclusion.

What of the electron itself? It has certainly not been seen, and the chances against its ever being seen are overwhelming.

What of the future? Do you think it will ever be able to see "farther," to get greater and greater magnifications? Well, up to a short time ago it was possible to magnify only 100,000 times. Careful refinement of the electromagnetic coils—"souping up" the microscope—doubled that. We've reached the theoretical limit of the electron microscope because of the wavelength of the electron. But we've been playing around recently with neutrons. Maybe there will be something there. You can focus them, you know. . . .

What of atomic power? Is the electron

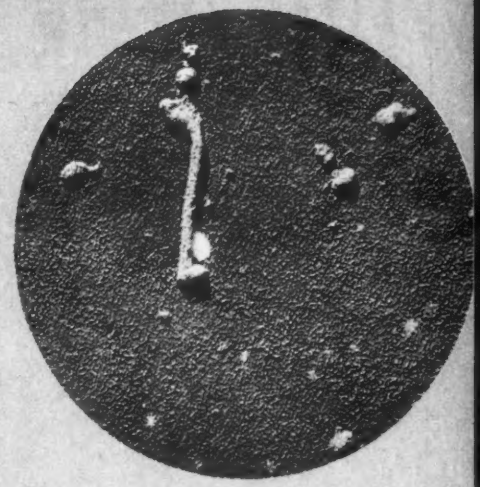
microscope being used to further this development? Blank silence. I gathered the impression that the electron microscope was used on the Manhattan Project at its very beginning, however.

What about cancer research? Yes, definitely. In fact, new instruments are being devised which will make it possible to study sections of the nuclei of these renegade cells. With the tremendous magnifications now possible, a new approach toward cancer study, the exploration of intimate cellular details, can be made. This will perhaps give direct evidence of destructure metabolic forces which heretofore could only be assumed.

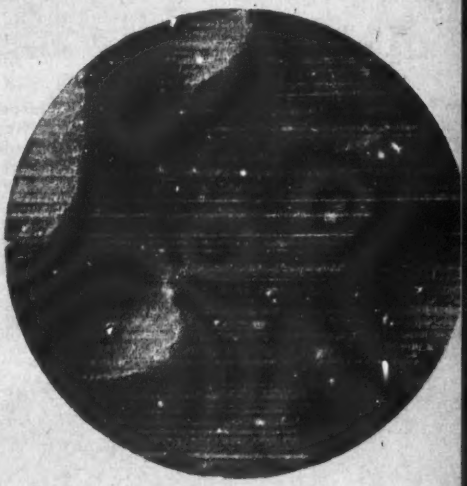
What about the virus, the antibody, and the chemical germ fighters such as penicillin and streptomycin? Yes, medical researchers have seen influenza, smallpox and many other viruses. They have been able to watch the action of bacterial destruction, and to understand the mechanisms of serums and antibiotics and that mysterious agent of infectious diseases among the germs themselves, bacteriophage. It is very likely that they will at last get some "inside" information as to why the germ of tuberculosis is so difficult to kill within the human body, and how bacteria become resistant to penicillin and sulpha and other chemicals which at first kill them. Much that was only guessed before has already become visible. After all, when you can see your enemy, you've got a fighting chance to lick him.

Before I left the plant I had the great thrill of not only seeing the electron microscope at work, but of operating it myself. Mr. Merrill said, "How would you like to see some of your own bacteria?" He gave me a toothpick, had me scrape some of the film from what looked like a clean, white tooth, and put the scraping into a test tube of distilled water, twirling it about to suspend the bacteria in the liquid. He picked up a bit of collodion in an eye-dropper and dropped it on the surface of some water, where it spread out into a film which was, he said, one millionth of an inch thick. He took a tiny circle of 200-mesh wire gauze, no larger around than the eraser of a lead pencil, slipped it under the collodion film, and raised it so that the film adhered to the gauze. Then he placed a drop of our germ suspension upon it, let it dry, placed it inside a metal cartridge, started the pump which evacuated the air, and turned on the power. "Twist this dial," he said, "and that one. Now watch the fluorescent screen."

A weird-glowing silvery image began to appear. "Now twist this," he said. The image came into focus. There were my germs, as clear [*Continued on page* 166]



Picture above shows the things that give us influenza. The small dots have not yet been positively identified. Scientists are cautious, but they say it's just possible that they're molecules.



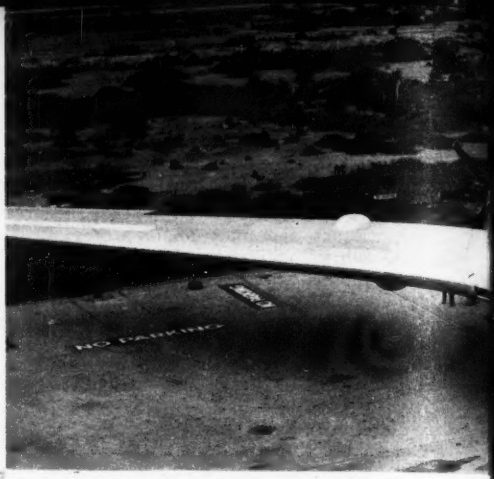
The brilliance of a diamond depends on the smoothness of its polished facets, naturally—but how smooth is smooth? Above picture shows part of a face of a diamond at 30,000x. Not so smooth!

Little Wing

A flying model of the XB-35.

Right: The "Big Wing" undergoes its first taxi tests at Northrop's Hawthorne plant.

Below: C. L. Bates, Northrop's top designer, admires Flight Officer Sharp's model.

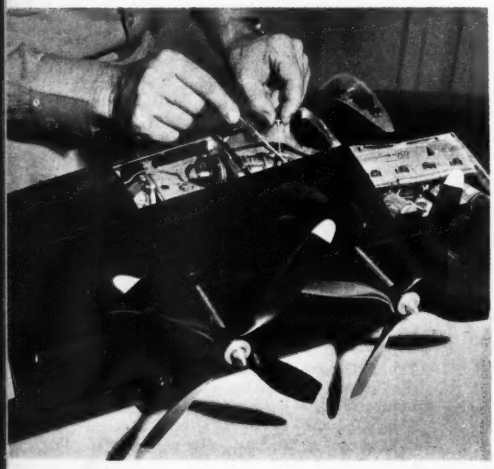


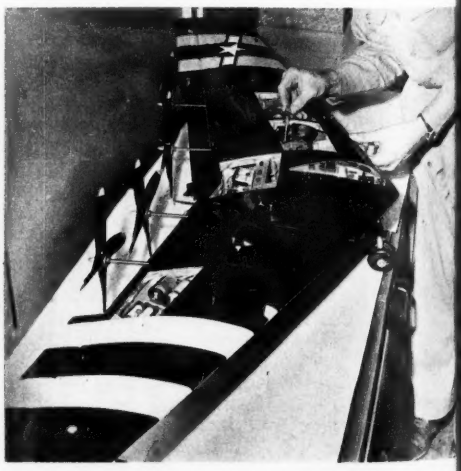
WITH only a magazine picture to guide him, Flight Officer Edward J. Sharp, U. S. Army, set out to build himself a flying model of the XB-35 Flying Wing. How well he succeeded is shown in the photographs. But success was not without effort —more than 450 hours were spent in construction!

Perhaps the greatest tribute paid the model was frank admiration of Northrop engineers who designed the original XB-35. And this admiration was not unfounded, for Sharp's model has—yes, everything! Retractable landing gear, landing and navigation lights, automatic flaps, conventional lucite canopy, dummy radio gear, and universal joints in the propeller shafts are a few to mention.

With a 64-inch span, the model weighs approximately 11 lbs. when gassed for a half-hour flight. Four engines entirely en-

Below and right: Sharp adjusts the inboard port powerplant. Each of the Little Wing's four engines has its own coil and batteries. Switches operate canopy and navigation lights.



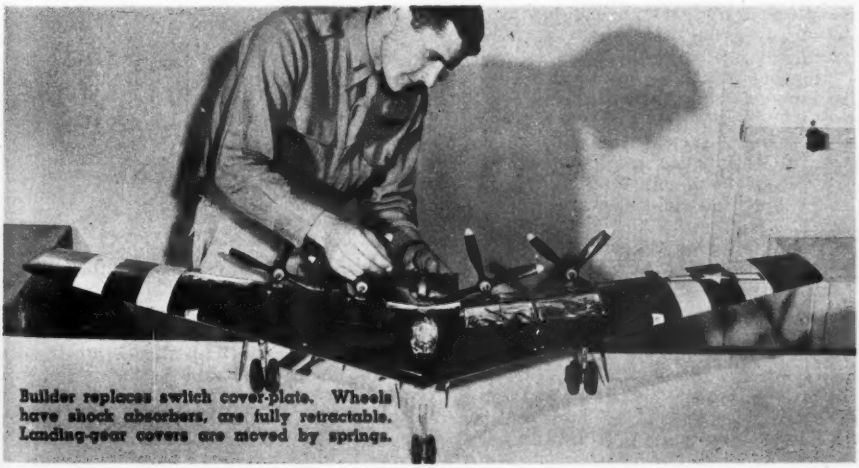


closed in the wing are each connected to a four-bladed propeller by means of a jointed extension shaft. Each engine has its own coil and batteries, and a pair of gasoline tanks contain the fuel. The model may be landed at any time and the engines automatically stopped by means of an ingenious knife switch arrangement actuated by the nosewheel strut. This switch, hand-set while the model is at rest, engages the nosewheel strut when it is retracted. Then, when the nosewheel comes down for the landing, the strut trips the switch and stops the engines.

Three flight wires are used to fly the model—a conventional U-control, and a third wire to operate the landing gear. When the gear wire is pulled, a spring locking the landing gear in the downward position is released and the gear retracts. Constant tension of about 10 pounds must be maintained on the gear wire during flight. When this tension is released, the outer main gear is pulled down by centrifugal force, while the nose and inner gear are forced downward by springs. All three wheels are equipped with spring shock absorbers. Cover-plates actuated by springs enclose the gear in the wing when it is in the retracted position.

The flaps are operated by air pressure. With the engines running, the slip stream forces the flaps to move upward against the tension springs to about 30 per cent of full-flap application. When the model is airborne, the flaps are forced into the full up-position. When the landing gear is lowered and the engines stopped, reduction of air pressure against the flaps causes them to open.

Because of centrifugal force, 60 mph is Little Wing's most practical speed. •

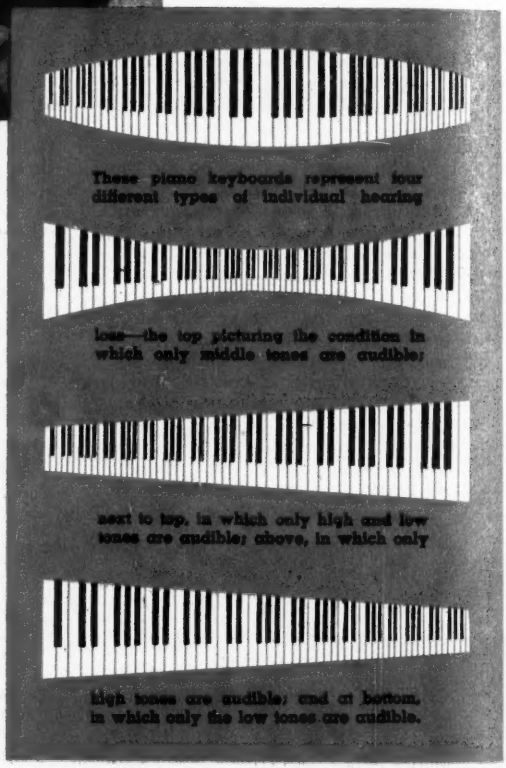


Builder replaces switch cover-plate. Wheels have shock absorbers, are fully retractable. Landing-gear covers are moved by springs.

New Ears for the DEAF

The new midget hearing aids are custom tailored according to your individual needs.

BY GOLD V. SANDERS



These piano keyboards represent four different types of individual hearing loss—the top picturing the condition in which only middle tones are audible; next to top, in which only high and low tones are audible; above, in which only high tones are audible; and at bottom, in which only the low tones are audible.

SURPRISING as it may seem, 20 million persons in this country are hard of hearing. This estimate takes in those whose hearing loss is small, not yet a serious handicap. But in the majority of cases any loss of hearing becomes progressively greater with time.

Since about 96 percent of all these people could be greatly helped by modern hearing aids, it will be seen that millions are passing up the benefits of these remarkable devices. With many, this is due to a peculiar vanity. Specialists in this field say that people who find their hearing is failing are strongly inclined to go on and on, refusing to admit it.

Hearing aids have undergone an immense change for the better within the past few years. This is due largely to advancement in electronics, particularly by the development of midget electronic tubes of great sensitivity.

Today's hearing aid consists of a single, compact case into which are packed from two to four of these tiny tubes, a microphone, amplifier, resistors, condenser, transformer, wiring and both A and B batteries. Outside the case there are control buttons or knobs to regulate volume and tone, just as on a radio set. The ear-piece, or loud-speaker, is attached to this case by wires that are thinner and less conspicuous than ever.

It was wartime developments in electronics and other branches of science that made these small and efficient hearing aids possible. The greatest single reduction in bulk is in the batteries, which have been so revolutionized that they give sufficient power with only a fraction of the former size and weight. The battery pack, which was a separate unit before the war, and the bulkiest part of a hearing aid,

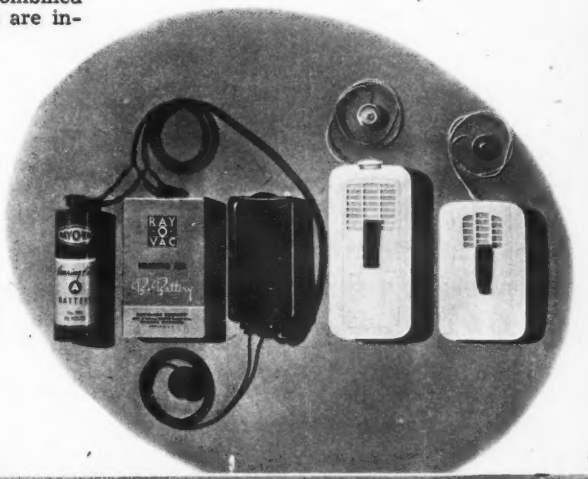
Audiometer being used to test a girl's individual type of hearing loss, preliminary to the prescription of a correcting hearing aid.

has almost gone out of the picture.

Even with all components combined in one unit, these new outfits are incredibly small. The newest model of the Acousticon, for instance, weighs only 5½ ounces. This is a far cry from the first electronic hearing aid, made in 1921 for Thomas A. Edison, who was very hard of hearing. This pioneer device was about the size of a baby grand piano, with tubes as big as a water pitcher, so it could not be called portable. Mr. Edison connected his ear-piece, or receiver, to it with a long wire so that he could move about his office while still attached to it.

It is the electronic tube that has opened up brighter vistas for all the hard of hearing. The uncanny abilities of the vacuum tubes to shape and amplify sound waves now give partially deaf persons practically normal hearing. There are very few who cannot be helped at all.

Deafness, or partial deafness, cannot be overcome merely by making sounds louder through electronic amplification. Tone is actually a more critical factor than volume or loudness. The modern instruments are capable of being fitted to the individual's own pattern of hearing loss, much as spectacles are prescribed. The hit and

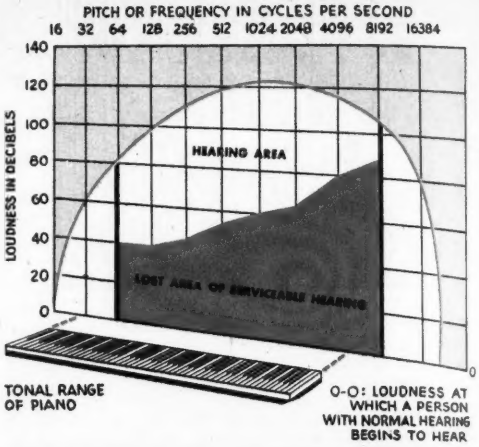


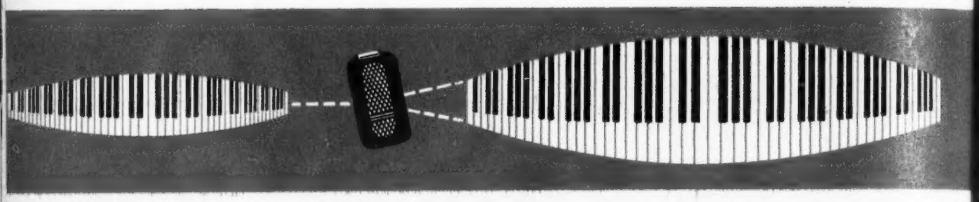
Compare the prewar hearing aid on the left with the successively smaller ones on the right!

Happy face on a child who hears! She'll lower her finger when no longer able to hear test tone.

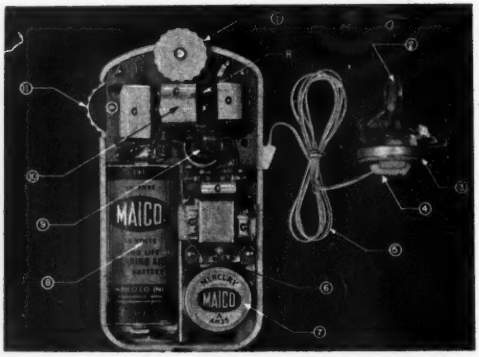
miss method of trying a hearing aid is as out of date as selecting glasses by the same method.

Our sense of hearing is an extremely complicated thing. The sounds we hear are of various frequencies, the normal ear commonly receiving a range of about 16 to over 20,000 cycles per second. No person's hearing is equally keen over this entire range. A person who is hard of hearing may be deaf to sounds of high or medium or low pitch, or partly so, while able to hear sounds of some frequencies quite well. The problem in fitting him with a hearing aid is to give help where it is needed without blasting his ears in the frequencies where he has little or no hearing loss.





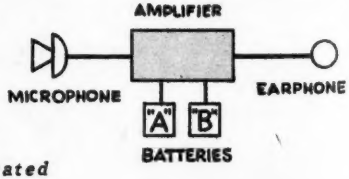
A hearing aid should do more than amplify. Above is represented the magnified distortion of former aids; below, correction effected by the new.

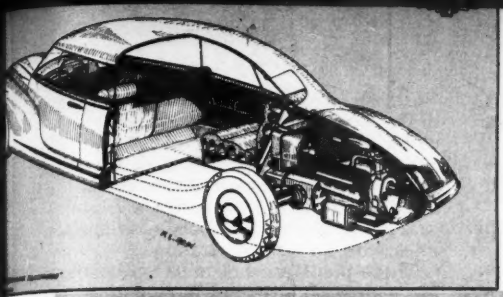


Component parts of the new Maico midget hearing aid are: 1, volume control; 2, ear mold; 3, crystal receiver; 4, removable plug; 5, flesh-colored conductor cord; 6, fitting screws; 7, A battery; 8, B battery; 9, button bias battery; 10, input tube; 11, auralizer switch. C denotes condenser, R denotes resistor. Not visible are two other tubes and the microphone (which is on other side of case).

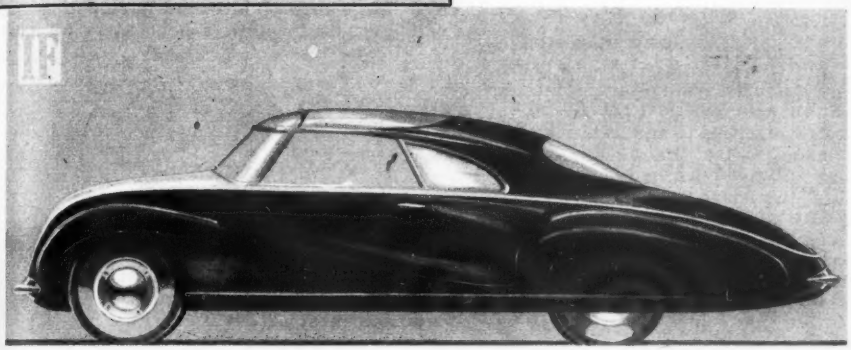
This seemingly impossible feat is accomplished to a remarkable degree by these modern instruments. First, the patient's individual pattern over the whole range is ascertained with the audiometer, itself a remarkable electronic instrument, which enables the expert to draw an exact curve indicating the degree of deafness in all usable frequencies.

The hearing aid for this individual is [*Continued on page* 166]





touring veranda



IT'S a veritable porch-on-wheels, or touring veranda, according to American observers of Italy's latest bid for prestige in the luxury automobile field. Its official name is the IF Car Type 8C. IF stands for the Isota-Frashini automobile works of Milan, Italy, and C. F. Rapi —who drew the sketches shown above— is the firm's chief designer. The car's top and sides are of Plexiglas and the windshield—minus the usual center strip of metal—is of shatterproof glass. Power is supplied by an airplane type, 8-cylinder, V-shaped engine, which the designers say will propel the car with ease at 93 mph. The rear engine permits the body to clear the ground by only eight and one-half inches. The motor is water-cooled and has a low, wide radiator with twin fans. And here's good news to flat-fixers: four automatic jacks fixed to the steel frame can be operated from a control handle inside the car. The gas tank, spare tire and tools are under the hood. •

Midget Recorder

IT'S small enough to fit in your pocket and it will record what you or anyone else says for 66 minutes, with or without other persons knowing a record is being made. The midget recorder consists of a magnetic wire .004-inch in diameter—about the thickness of a human hair—which is fed from one reel to another through a magnetic recording head. As sound enters the microphone it is electronically converted into a magnetic field which magnetizes the wire. The magnetized wire permits the reproduction of the sound so recorded. The sound can be removed by demagnetizing the wire. The device weighs only three pounds and can be worn concealed or carried in a case like a pair of binoculars. •

HELICOPTER BUS SERVICE

Integrated bus-helicopter-airline service will save time and nerves.

BY ANDREW MESSICK

PRESENT airline travel is fast and comfortable once you get into the air. The catch is getting to and from the airport. It's a shocking fact that airline patrons spend from 30 to 60 per cent of their total travel time in surface vehicles.

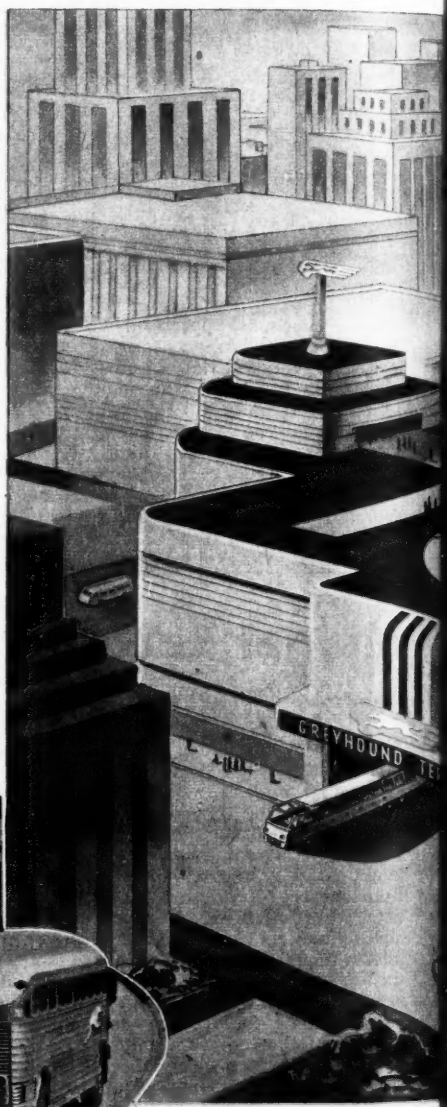
Bus companies now have elaborate plans to change all this with passenger-carrying helicopters integrated with ground-bus feeder lines. And they are not stopping with the problem of getting airline passengers

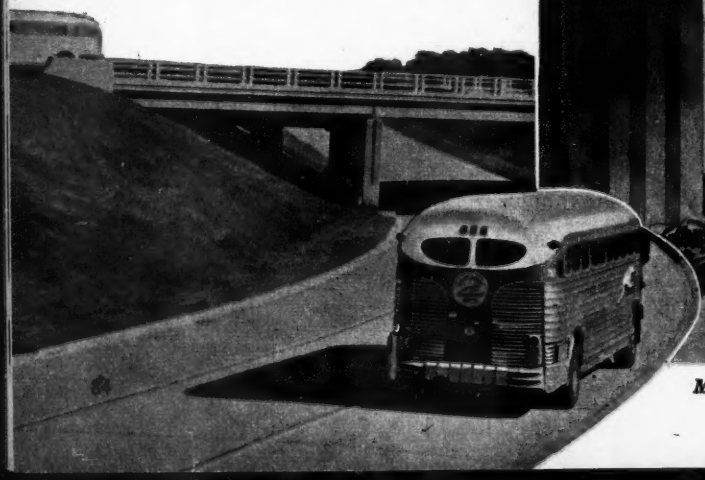
to and from outlying airports. Far from it. They have a sharp ear for all demands for air transportation not met at present by existing airlines, especially those for short hauls.

The bus lines point out that 50 per cent of all trips made by bus passengers are for distances under 50 miles, and that another 39 per cent are for distances between 50 and 250 miles. For short trips it is seldom worthwhile making the tedious journey to the fixed-wing aircraft terminals even under the best of conditions.

They also expect to bring air travel to the thousands of small towns which are not covered by the big airlines. An integrated system would coordinate surface lines with air-ground stations.

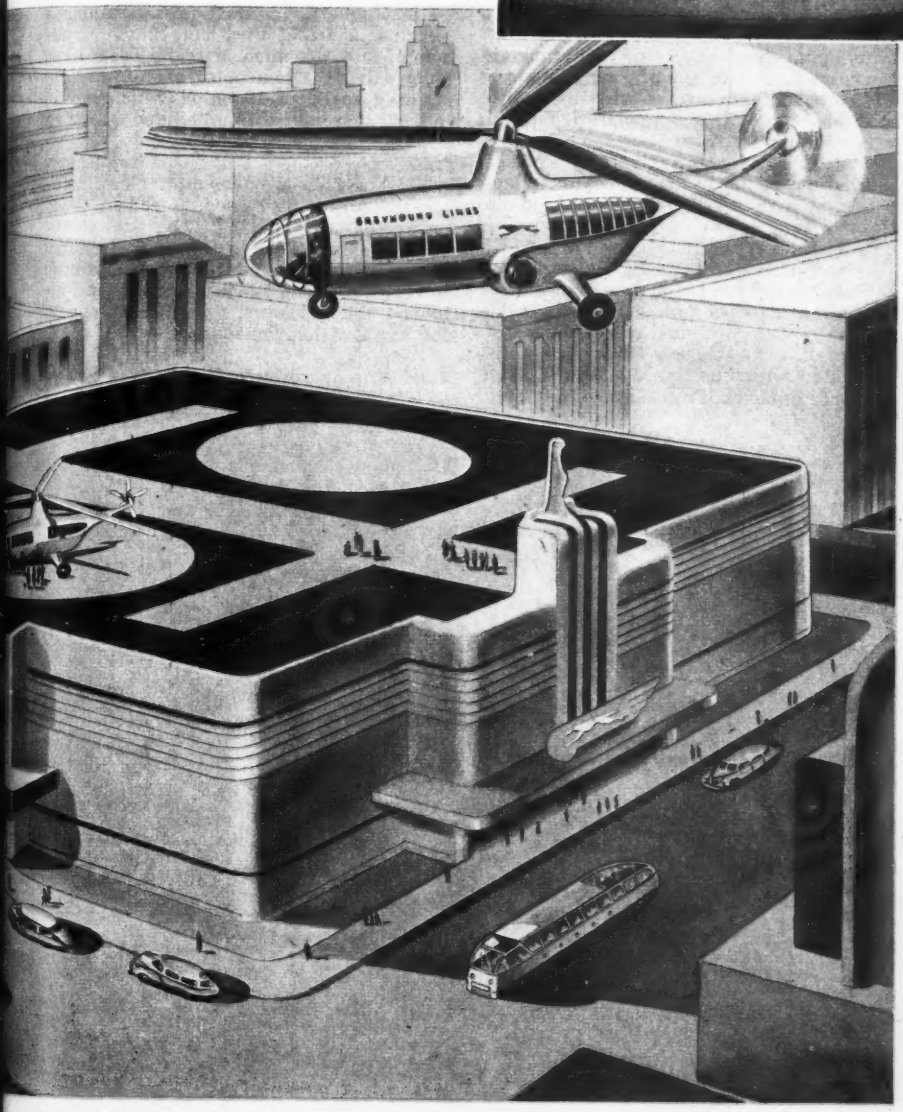
These plans are not mere speculation. More than 80 bus lines have applied for permits to operate helicopters for pas-





senger transportation. Things will be popping when, and if, the Civil Aeronautics Board gives the go signal. Present interpretations of the Civil Aeronautics Act would prohibit companies engaged in other forms of transportation from entering the aviation field. Bus companies are waging a fierce battle for interpretation in their favor. Services have already been

Greyhound is planning airbuses like model, right. Below: A future air-ground terminal.



planned and designed by Greyhound and other companies of the nation for air transportation which is not practical at present for fixed-wing aircraft.

Greyhound officials, in connection with leading aircraft authorities, are convinced that the helicopter is the aircraft best suited for local air service. The practicability of the helicopter, moreover, has already been thoroughly established through its acceptance and development by the Army.

Feasibility of integrated air-bus service was first demonstrated near Detroit. Two Sikorsky S-51 helicopters purchased by Greyhound Skyways for experimental purposes were used for the first flights in the actual interchange of passengers with motor coaches. This demonstration, which was attended by Igor Sikorsky, helicopter inventor, and by bus company officials, proved the ability of the helicopter to land safely at highway intersections or in the limited space adjoining bus terminals.

In each case the helicopter landed in a fifty-foot circle with negligible horizontal motion, exchanged passengers with waiting buses in a matter of minutes, then ascended vertically and continued its journey.

"Not only can this new air service be coordinated with bus line operations," said Manfred Burleigh, President of Greyhound Skyways of Michigan and the Great Lakes Greyhound Lines, "but, it can also act as a 'feeder' service to the present lines."

Mr. Sikorsky pointed out that while the experiment opened an entirely new field for use of helicopters, its adaptation presents no problem.

"On the basis of both our engineering and operational experience, we believe it entirely possible to build helicopters to carry a dozen or even a score of passengers in the near future," he said.

A large helicopter can land in an area 80 feet square. In practical operations a terminal 250 feet by 300 feet would accommodate two such aircraft. Tests have shown that the helicopter has an efficient cruising speed of 100 mph which would indicate a reasonable scheduled speed of approximately 90 mph.

Because of the ability to maintain low speeds, or even to hover motionless in the air, difficulties now encountered in foggy or overcast flying conditions are almost entirely eliminated. In the unlikely event of motor failure, the large rotor continues to revolve, acting as an air brake, and allowing the helicopter to settle slowly to the earth without mishap. •

Buses have already taken to the air in successful tests made by Greyhound Skyways' two S-51's.

MI LOOKS AHEAD

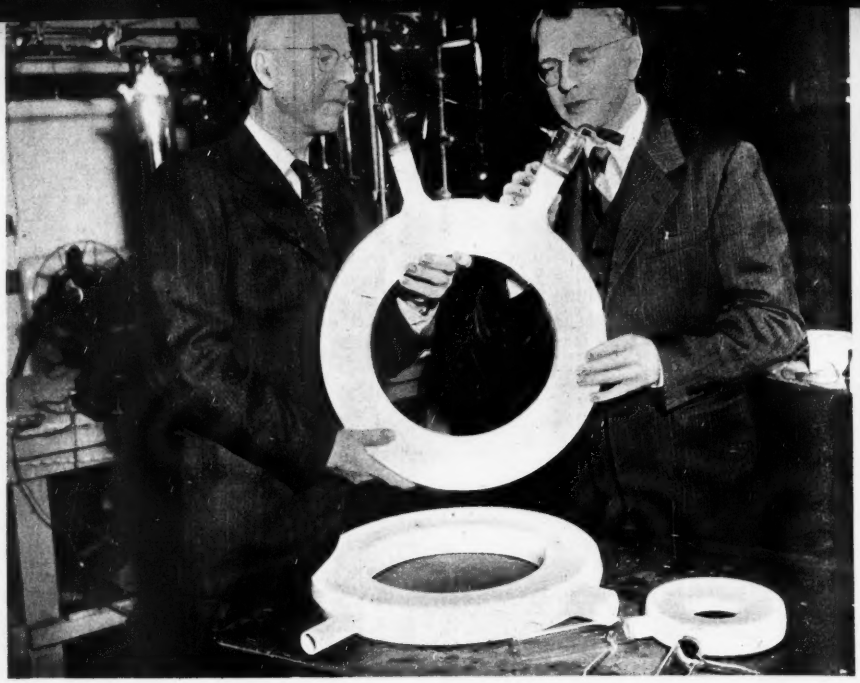
WITH LOUIS WOLFE

Two-Armed Cleaner eliminates risking your neck when you wash the outside of your windows. The U-shaped device straddles the pane and washes both sides at once. There's no worrying which side streak is on, either.

Built-In Coat Hangers will mean the end of excuses for not hanging your clothes up properly. The hangers are suspended from small loops and are made of thin flexible strips which do not mar the appearance.

See-Saw Bed oscillates up and down with the patient's breathing and has proved very successful in aiding the treatment of polio victims and those suffering from respiratory diseases. The bed is mounted on power-driven frame.

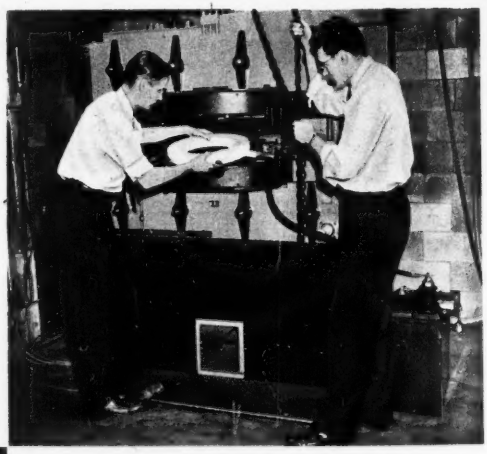
Sand Tanks will be added to the list of auto accessories next fall. They'll enable motorists driving in snow or on icy roads to apply sand whenever necessary. Each set of tanks will hold a 45-minute supply of sand.



20 Million Volts in a Tube

Right, Prof. Donald W. Kerst, inventor of the betatron, is putting the powerful round porcelain vacuum tube into place.

Below, head potter of the U. of Ill. trims one of the "horns" through which the tube's electrical elements are inserted.



THE voltage is born in a tube shaped like a "donut"—wide, narrow in cross section, hollow. The tube is used in a betatron. It contains an electron source. A surrounding magnetic field imparts an increasing circular velocity to the electrons. Round and round they go, faster and faster—till, when they're almost at the speed of light, they're made to strike a target, and a 20-million-volt X-ray beam is created. Labs put this beam to work in atomic researches. Industry uses it to search for hidden flaws in its heavy metal products. For it sees right through metal. Twenty inches of steel can keep no secrets. •

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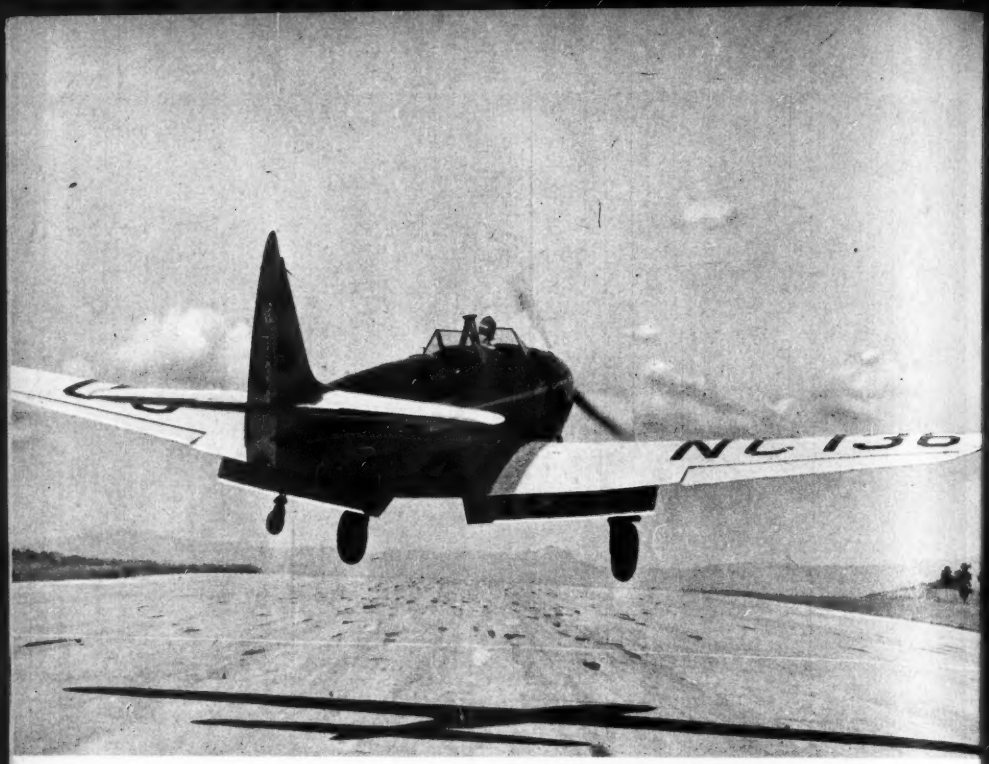
TEXACO DEALERS IN ALL 48 STATES

Tune in: TEXACO STAR THEATRE presents the new TONY MARTIN show every Sunday night. See newspaper for time and station.



These planes stretch airports

Casters and variable-incidence wings really "stretch" a one-strip runway.

BY C. B. COLBY

WHAT aviation needs is an inexpensive way to stretch an airport and flight strip—quick. Something that will enable a single-runway field to take on quickly the various headings of a multiple-runway field. And at no additional cost.

It may be that aircraft manufacturers will have to build this versatility into their ships rather than the fields. It's about time. For years, now, airports have been built to handle planes; planes have *not* been designed to take full advantage of what landing facilities now exist. This is particularly true of the small personal plane that doesn't require big cargo and passenger-handling facilities.

It all goes back to the fact that "you never know which way the wind will blow next" (though if we did we still could not do anything about it). As aircraft are built today they must land directly, or nearly so, into the wind. And because they must, airports must be given multiple runways of various headings. This keeps airports large. And, due to the land required, construction close to city centers, or even in the immediate suburban area, becomes prohibitive.

Could aircraft land cross-wind, or partially so, almost any community would be able to whittle out a plot to contain the 200-by 2,000-foot flight strip that would suffice. Parks, playground areas, covered railroad tracks and waterfronts—all are possible locations. At present, unless a prevailing wind blows continuously down their length, they would be relatively useless, and the community is forced either to do without an in-town landing strip or build it far out where multiple runways can be provided.

The trick is to build aircraft capable of

landing straight down the runway when the wind is from any heading other than parallel to the runway. To do this is much more than a matter of swiveling the main landing gear; Bleriot did that when he flew the English Channel way back in 1909. Such factors as shimmy, stress, center of gravity travel, visibility, and brake design enter in to complicate things.

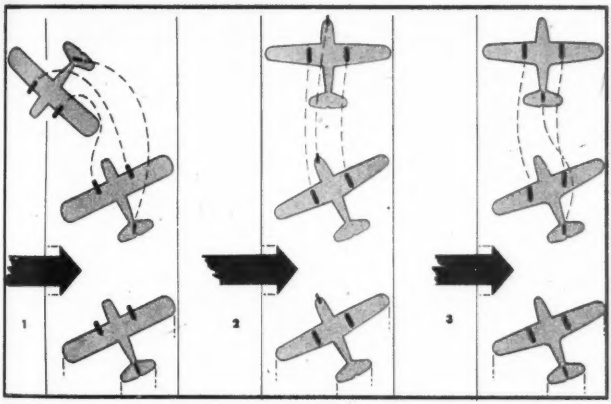
Some experts hold out for free castering of all the wheels of the personal aircraft so that they will adapt themselves to the runway direction as soon as the plane touches down. Others maintain that the wheels should be pre-set by the pilot to head down the runway before the wheels touch. The latter theory was tried out during the war by the McLaren Undercarriage Co., of England. They took one of our North American P-51 Mustangs and equipped it with steerable wheels that before landing were pre-set or "aimed" by the pilot by means of cockpit controls. The pilot would estimate his drift and the angle of his contact with the runway, then set the controls accordingly. It worked—and well—but the process was too complicated and installation too expensive for general acceptance by personal aircraft manufacturers.

With the perfection of such a development the plane may still "crab," or head partially into the wind, even after it has touched its wheels to the landing surface, while its gear will automatically adjust itself to the direction of travel of the plane as a whole. After a short run the plane itself will swing into the line of motion and travel straight down the runway, as in a normal landing.

The problem is to design a gear that will be simple, rugged, and foolproof. With its realization will come an immense boost to the airport and flight-strip program, for then the two-way field consisting of one runway will be sufficient for almost any small community.

A second airport-stretching device under development is the variable-incidence wing. This wing, when perfected, will enable the aircraft to glide down to a field with nose low for maximum visibility but wing at maximum lift position, giving the aircraft lift all the way without picking up excess speed. For short fields and carrier use it is ideal.

The most recently successful application of this variable-incidence wing was applied to the British Supermarine 322, designed



All three planes are seen "crabbing" just before the "touch-down," arrows indicating the wind direction. (1), with two fixed front wheels, is thrown into a ground loop; (2), requiring steering of its nose wheel, fares better; but the castered wheels of (3) turn along line of motion, effecting a perfect stop.

PT-19 with casters comes in at a sharp angle and makes a fine landing—on the bias. Note wheels.

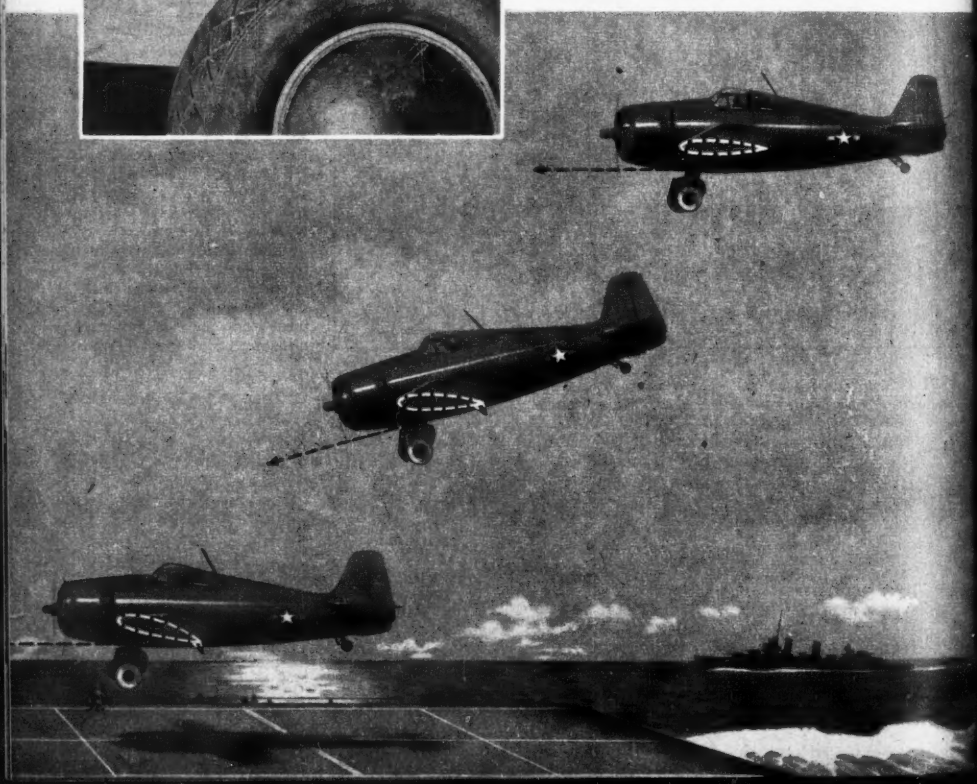
for carrier operation as a combination torpedo, bombing and reconnaissance plane. The wing is pivoted on the front spar, and the angle of incidence is changed through operation of two screw-jacks joining the rear spar with the fuselage. A chain drive unit turns these jacks, raising or lowering the aft spar of the wing and thereby changing its angle relative to the fuselage. If need be these jacks may be operated manually. The weight of the unit was found to be negligible. With the wing at maximum angle of incidence the fuselage presents an angle of fifteen degrees to the ground. At this angle the pilot has excellent forward and downward visibility, and even during the flare-out in landing the nose is still low enough to give a good forward view. Of course, such a wing makes possible the use of shorter and narrower flight strips.

Under normal aircraft wing design conditions a plane landing at this angle would pick up such speed that additional landing run—and space to do it in—would be required.

A combination of casters and the variable-incidence wing seems to make the best "airport stretching" means in the offing. Although both require much research and development before they'll be ready for general incorporation in personal aircraft design, they do offer a brighter future for the small-town airport and single flight strip—and the salvation of aviation for you and me and the chap down the street. •

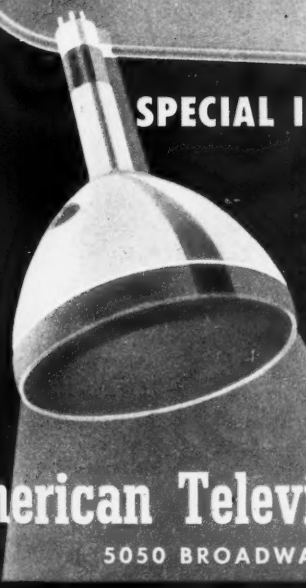
Swivel on a Fairchild PT-19; tested under CAA cross-wind landing gear development program.

Drawing shows plane with variable-incidence wing making a gliding approach with nose down (fine visibility) but wing at position of maximum lift.



TELEVISION-

Does it Hold A Future For You?



SPECIAL INVITATION TO WAR VETERANS

With extensive new training facilities under the personal supervision of the famed inventor of the radio vacuum tube, Dr. Lee de Forest, we are able to accept additional applications from Veterans for Television training under the G.I. Bill of Rights. For qualified men who are seriously considering entering a residence school, we have a limited number of Home Study Courses which are available free of charge. Your success with this course will not only help you to decide your own future in Television but will also aid us greatly in qualifying you for residence training.

Send your name and address for your Eligibility Questionnaire. If you qualify under the simple rules, you may start your Home Study Television Course at once and entirely without cost or obligation to you.

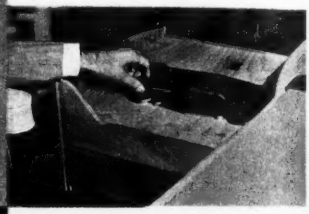
Ask for Questionnaire No. 10

American Television Laboratories, Inc.

5050 BROADWAY · CHICAGO 40, ILLINOIS

You're off the beam, Bub—it's not a flying wing. It's not a plane at all. It's a desk. A desk to be used in an office. Of course, it's grander, even, than the ones you see in the movies—but before long you and everybody else will have one much like it (its designers hope). It's not for sale! Its revolutionary design and functional features are a concoction intended to make it a model for the general run of tomorrow's office furniture.

SUPER-DUPER DESK



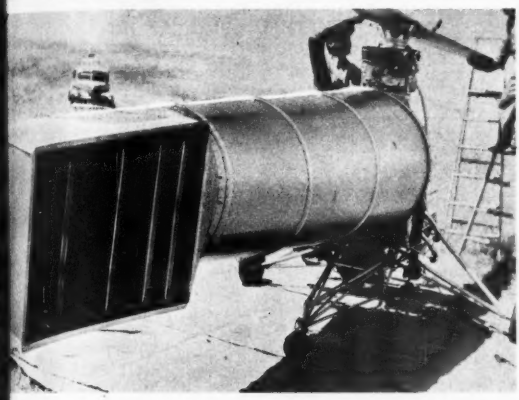
Naturally, your dream desk—that you're maybe gonna have—will have to allow 100 per cent relaxation—and how are you going to relax without a radio? So it has a radio.

Here's how your gorgeous big blond beauty looks from the business side. That "executive posture chair" can be adjusted to fit an executive of any leg, length, speed, beam.

You can't take a bath in it and your secretary can't cook her lunch in it—but it's not a bad desk. Not at all.

What could be more convenient than a built-in electric shaver to brighten the darkening business face against the rigors of the cocktail hour?

That thing's a built-in dictating machine. You just talk to it. It can't talk back—never asks you to spell it please—never, never sheds bobby pins.



Jet Helicopter

JET thrust has been employed successfully to counteract helicopter rotor torque, it has been announced by United Helicopters, Inc.

The jet system replaces the tail propeller of the conventional single-rotor helicopter. There is a compressor fan mounted just behind the engine and forward of a "stove pipe" tail. Air under pressure is forced through the fuselage to the tail orifice where vanes direct the jet thrust laterally from the fuselage.

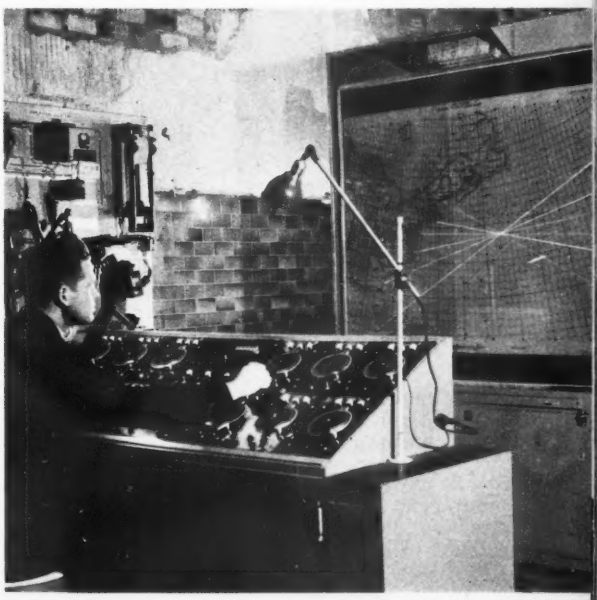
The jet torque helicopter is one more step in the development of a practical vertical-lift aircraft. •

Tail prop of this 'copter is conspicuous by its absence. Jet does the job.

Vanes at end of "stove pipe" fuselage direct thrust of jet stream laterally, effectively counteracting torque from rotor.

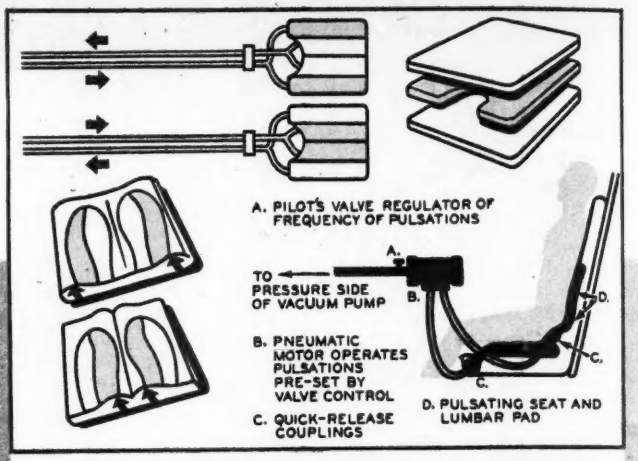
SOS Finder

A DIRECTION Finding and Dead Reckoning Board is now being used to speed the rescue of survivors who haven't had time to radio their position before abandoning ship, but have been able to get off a few SOS's. Located along the eastern seaboard are Coast Guard radio stations constantly alerted. When three or more pick up an SOS, each telephones the Direction Board operator and gives the angle from which the signal was received. On his Board the operator sets light beams at these angles. The crossing beams give a fix—the exact spot to which to dispatch rescue ships and planes. •



Beams on Board are set according to the angles at which shore stations receive the SOS signals—giving an accurate fix.

Soft Seat for Pilots



Seat's red areas show bladder inflation, the white, deflation; the two sets alternate. Top right, bladder between foam rubber.

COMPRESSION fatigue, they call it—what you feel when you have to sit and sit and sit, for hours, unable to get up and move around. Pilots really suffer from it on long trips.

But now, no more! There's been an invention. It's a seat that massages you in flight. While you sit. Where you sit.

Both seat and a lumbar pad contain specially designed multiple-celled rubber bladders, sandwiched between layers of foam rubber. Air pressure increases are effected alternately in adjacent cells and do the massaging.

The muscle of the apparatus is an 11-ounce pneumatic motor. Rate of pulsation is controlled by a small regulator.

Would be a fine thing in an auto. •

LITTLE BIG TOP

Model builders will have a circus assembling these realistic sets.

BY LOUIS HOCHMAN

FOR some people, the circus comes to town only once a year, but for model building enthusiasts the big top can be an exciting daily experience, thanks to Tony Koveleski and associates.

An avid hobbyist and model builder since 1929, Tony hit the sawdust trail a year ago, digging into the past and present of circus life to come up with details and dimensions of practically every piece of circus equipment used.

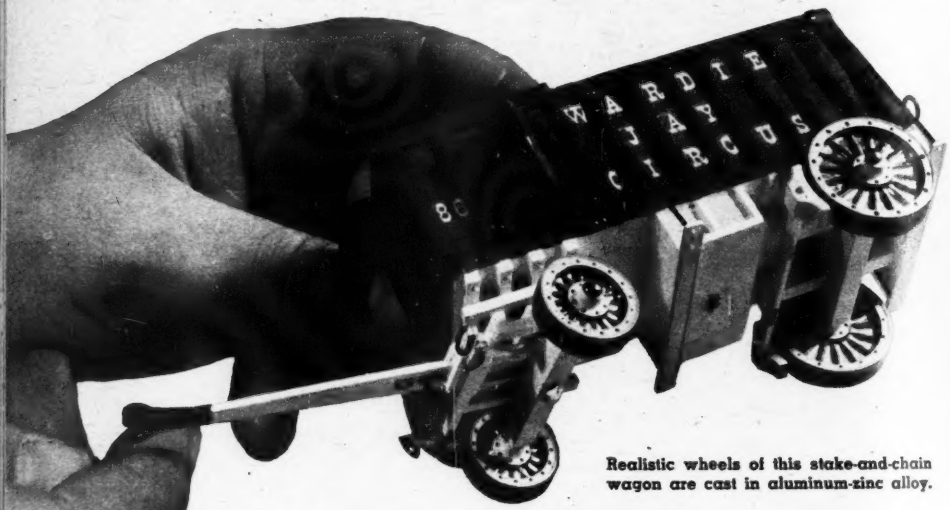
This vast amount of research has gone into producing a line of ¼-inch scale models of the circus as it was in all its glory before city ordinances forced it to rubber-tire its sunburst wheels, and before tractors and trucks relieved the elephants of most of their work. Authentic down to the last detail, the small models are a hobbyist's delight. They come in build-it-yourself kit form and are so well designed that anyone from 10 years of age up can complete a wagon in one evening.

To make the construction work easier,

engineers of Koveleski's Hobby Lines Manufacturing Company in Scranton, Pa., have made every part in detail which would require any special skill to build. Wheels of intricately fine detail are cast in an aluminum-zinc alloy and require only painting. Brake shoes, wooden axles, wagon tongues, double-trees and single-trees come carved and shaped ready for sanding and assembling. Lettering and fancy painted scroll designs on the finished wagons are done with decals supplied in the kits. The result is not just another toy, but an authentic miniature replica of a circus wagon.

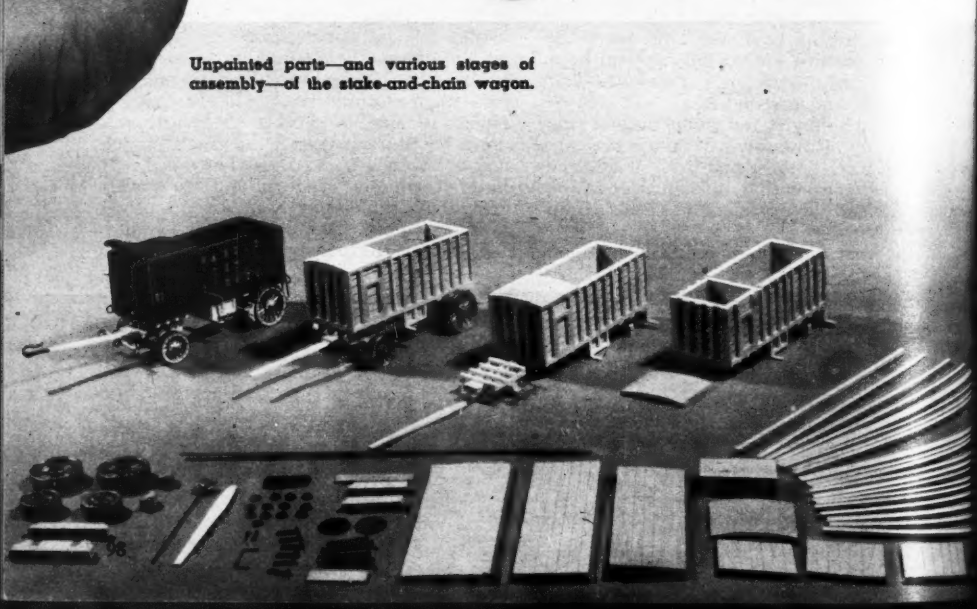
Digging further into circus lore, Koveleski and his staff have even entered the model railroader's field and produced a line of circus flat cars and stock cars which will fit on tracks of conventional model railroad equipment. With couplers and hardware to match, they permit the model railroad fan to hitch a traveling circus to his engines.

The calliope wagon of the "Wardie-Jay Circus" as the circus line is dubbed, is one of the most colorful models in the set. Its sides are decorated with images, in golden relief, of two jesters facing the calliope pipes. These relief images come cast in metal and have only to be cemented to the wagon sides and painted. An interesting feature of this wagon is the fact that the



Realistic wheels of this stake-and-chain wagon are cast in aluminum-zinc alloy.

Unpainted parts—and various stages of assembly—of the stake-and-chain wagon.



model builder can, as Koveleski has done, fit it with a tiny music box for realistic sound effects. The music box, however, is optional and doesn't come with the kit.

All wood that goes into these kits comes green to the Hobby Center where it is carefully selected for perfection. Only the clearest and best grades of lumber are used.

Animals and human members of the circus troupe are all cast in metal and have to be painted by the builder. Horses are supplied with tiny authentically duplicated harness sets which can be assembled in a few minutes and the horses realistically hitched to the wagons. Koveleski is always in search of skilled sculptors who can make the original scaled-downed miniatures of the circus animals and people from which the final molds are made for mass production.

At present, the talent that goes into the production of the Wardie-Jay circus models is quite impressive. The staff production workers are practically all model building enthusiasts who get a great kick out of every new model produced. Production manager Howard Greene comes fresh from eight years of engineering and managing at the Luscomb Airplane Corporation where with five engineers, he helped design the present Luscomb Silvaire Airplane.

Carmin Castellano, formerly a mechanical inspector at the Buffalo Shops of the Pullman Company, now engineers and designs the Wardie-Jay circus models, breaking them down to scale and working out the production methods. A model building fan for over 19 years, he is an enthusiastic owner and operator of his own model railroad.

Tony Koveleski who dubbs himself the "advance man," is the guy who press agents his tiny circus to the public. In true circus style, he cruises around city, town, and hamlet in his shiny 1922 Ford Model-T deluxe sedan which he had painted up like a circus wagon and christened "Advance Car No. 1." An advance car, as any circus fan knows, is the car that preceds the circus to town to make all arrangements for its location and publicity.

The ancient Ford, which Tony succeeded in heckling its 72-year-old former owner into selling him, had been kept in storage since 1928 and actually had been driven only 2,000 miles. As he proudly drives it through town, beeping its frog-voice horn at all and sundry, surprised citizens of this atomic age respectfully doff their hats while children laugh and chase after him.

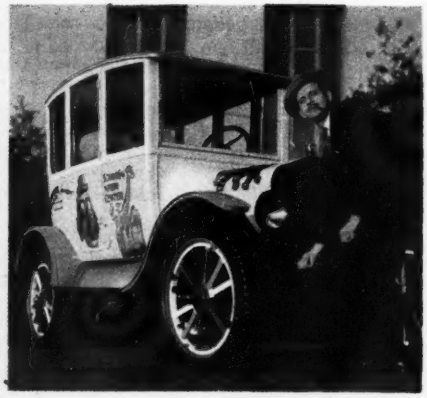
Tony, who holds commercial and instructor's flying ratings and was ferry pilot with the ATC during the war, is getting a Republic Seabee soon which he intends to paint up in the same manner and name "Advance Car No. 2."

Once, while setting up his model circus exhibit in a New York store window during the circus season, a group of circus bigwigs approached him and invited him to their hotel suite. There they showed him a scrap book of his models, voiced their appreciation for all he'd done to promote circus interest, offered him full freedom to

Below: One of Koveleski's helpers—they're all enthusiastic hobbyists—casts circus animals in a slush mold. All you have to do is paint them.

Above: Carmin Castellano, Wardie Jay models' chief designer, fits the top on lion's cage.

LITTLE BIG TOP



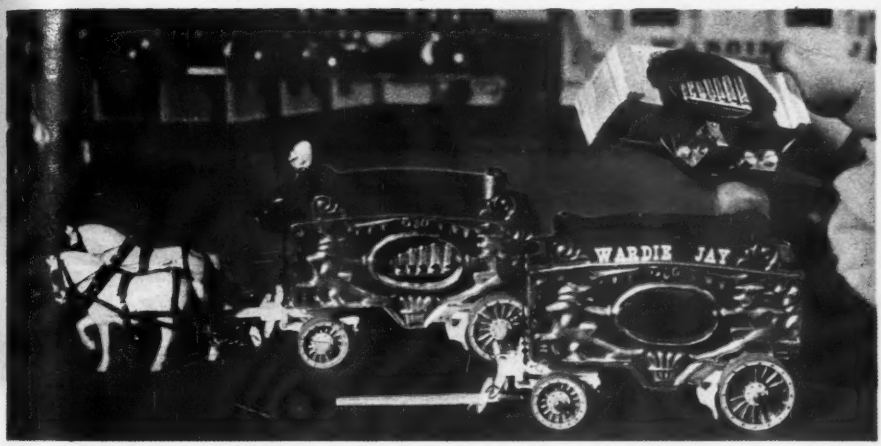
visit the circus whenever he chose, travel with it as long as and as far as he liked, and take all the photographs and measurements of circus equipment he wanted. Since that time, Tony has found all circuses equally enthusiastic over his models and eager to cooperate with him in any way that would increase and improve his model line.

As members of the Circus Fans Association, the Circus Historical Society, and the Circus Model Builders and Owners Association, Koveleski and his staff have gone farther than merely reproducing circus miniatures. Their keen interest in everything pertaining to the circus has captured and preserved a colorful era of the past. •

Left: Tony Koveleski, firm's owner, cranks his "Advance Car No. 1," a 1922 Model-T Ford.

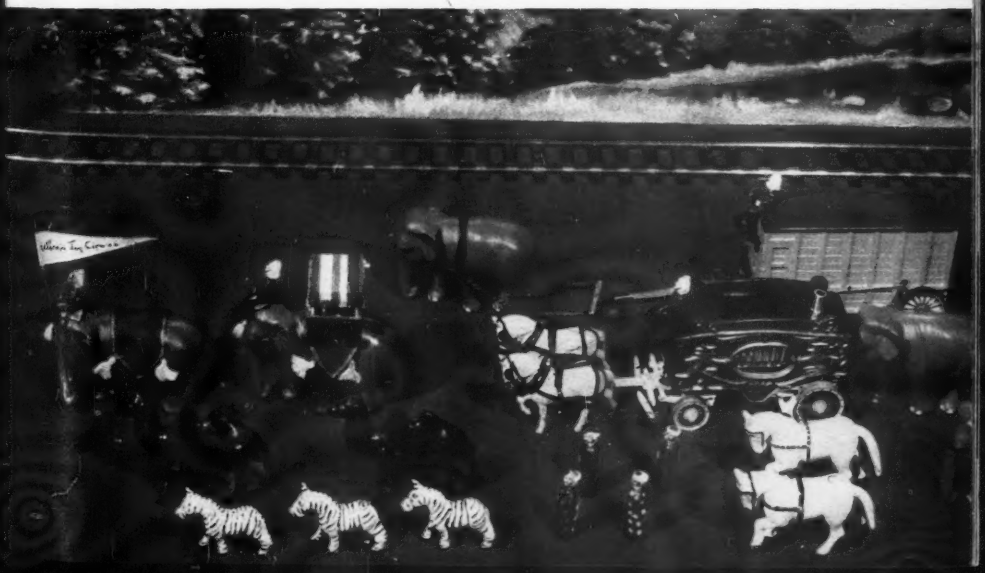
Right: Who wouldn't be proud to have assembled and painted this gay, realistic parade.

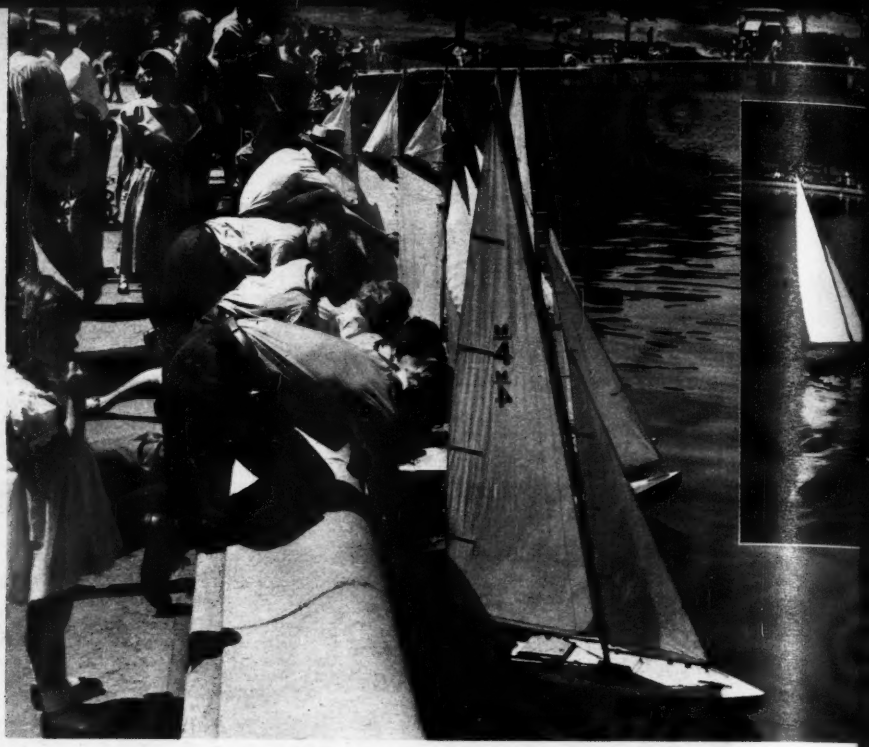
Photos by the author



Top: Tony bought out makers of tiny set in background before bringing out his Wardie Jay line.

Above: The calliope really plays if you put in this music box. It's not part of set, though.





Above: It's a tense moment—the start of a practice regatta across the park lake.

SHORE-LINE SAILORS

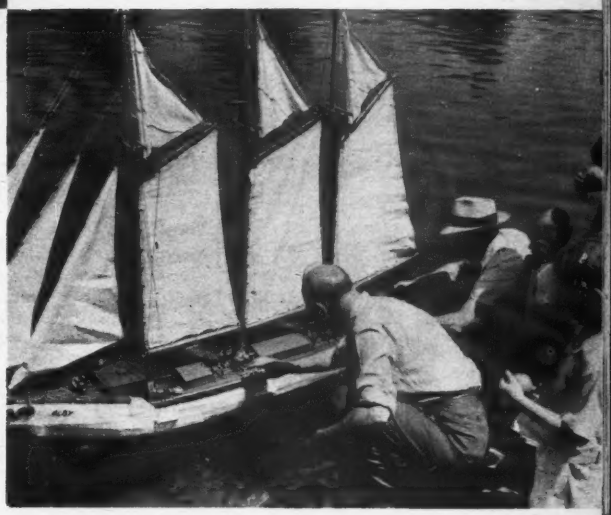
Easy does it. A young enthusiast carefully parks his craft in the sailboat garage.

They're precision jobs, each one. Below: A fan makes sure his mast and jib are perpendicular.

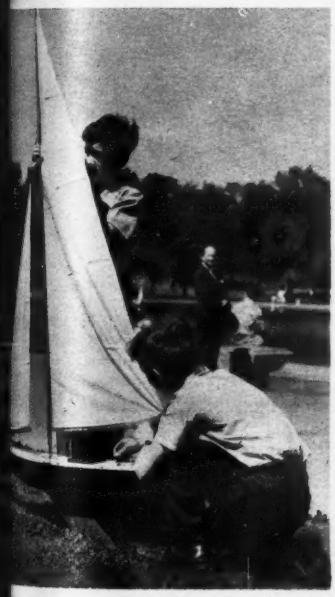
TRIM white sails dot the waters of hundreds of our inland waterways and man-made sailboat basins. For—as spanking spring breezes turn to the langurous winds of summer—model yacht builders are reaping the harvest of their winters labors. A lot of work goes into the construction of these graceful craft. The hardest part to build is the hull which consists of from eight to twelve jig-sawed sections. These hobbyists usually cast their own lead keels, too, to make sure their beloved boats heel over correctly—just far enough without danger of capsizing in the middle of the lake. It's worth it though, the thrill of watching a new sailboat take the wind and speculating on its chances of winning the regatta. These pictures were taken at the Model Yacht Basin in New York's Central Park, where young and old enjoy this sport. •

Above: Three graceful craft, well heeled over. Lead keels, weighing up to 20 lbs., prevent capsizing.

Marblehead racing sloops, like this one below, are most popular. Their sail surface covers 800 sq. inches.



Above: One of the most elaborate ships on the model yacht basin is this three-masted replica of a lumber schooner.



Right: There's room for all—from six to sixty. This sailorette puts out her tiny rowboat with as much pride and care as the saltiest skipper.

CAN YOU CANOE?

BY C. W. (TODD) DENNER,
Guttamoose Lodge, New Brunswick

JUST keep the center of gravity low, and you're as safe in a canoe as anywhere else. This is the principal thing to remember if you want to enjoy all the fun that a canoe can afford. Accidents happen only when someone does something foolish or thoughtless.

If you have spent any time in or around fishing and hunting camps you will have noticed that the professional guides, the most expert canoe handlers, never take liberties with the law of gravity. And they do not have accidents.

Keeping the center of gravity low simply means keeping most of your

To change positions, land. In a pinch one may crawl between the other's legs, keeping low and in center, hands on gunwales, using care.

Photos by Sid Latham

It's easy and safe—if you keep your weight on your knees, use a little horse sense and respect the law of gravity.

Left, the expert's cross bow rudder stroke, a steering aid in swift water or high wind.

Right, quarter sweep stroke. Stern paddler turns by sweeping paddle out and back.

weight, and that of other occupants, below the gunwales of the canoe. When you do this, a canoe is perfectly stable. If you don't do it, you have to make constant movements to keep balanced—like a tight-rope walker. That's tiring, unpleasant and decidedly unsafe.

For my part, I always paddle kneeling down, and so do almost all Indians and professional guides. It gives greater leverage and is better and more natural. I urge the beginner to start this way. Ten minutes practice a day will soon get you used to it. Put something under your knees to protect them until they get toughened, and after a while you will not need any padding. At first, you can put part of your weight on your seat.

Paddling is a simple matter. The strokes almost come natural to most people, but a few pointers may help you to become skillful sooner, and also prevent waste of energy and unnecessary fatigue. Those of us who have been brought up in the north woods have learned much from the Indians. Their methods cannot be improved upon.

Notice any Indian in a canoe and you'll see that he does not hold his paddle straight up and down, but slantwise across the body. The Indian drops the top of the paddle to one side as the blade comes out of the water, and keeps it in a horizontal position as it goes forward.

Draw stroke, for moving canoe sideways, is made by pushing with upper hand, pulling with lower. Below right, finish of the J stroke, most important stroke in canoeing.

That saves a lot of energy in a day's paddling.

Another way to conserve energy is to avoid moving the flat side of the blade against the water at any time except when you want to put power into it. By this I mean turn the blade edgewise when bringing it out at the end of the stroke, also when inserting it to start a stroke. And hold it edgewise when it is out of the water traveling forward for the next stroke, to avoid air resistance.

These are the methods employed by practically every man who earns his living by paddling a canoe, and it is this saving of human energy that permits them to push a canoe all day without seeming to tire. I would urge all beginners whose habits aren't too firmly fixed to concentrate on these few points from the very start. I'll promise you'll be able to outlast the fellow who uses less scientific strokes.

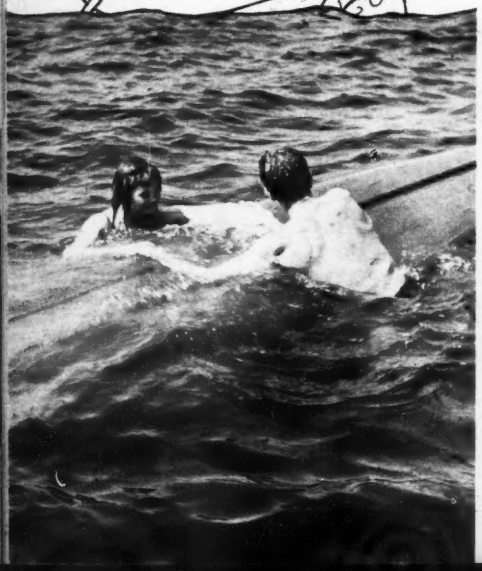
The most important stroke is the Canadian Chop or "J" stroke, which gives a combination forward and steering motion. When done on the left side it goes through the shape of the letter J; on the right side, of course, it goes the other way. With it, any paddler can send a canoe forward, keeping it headed straight all the time, without changing from side to side.

To do this stroke right, insert the paddle at a comfortable distance forward, not over-reaching, with the blade at a right angle to the side of the canoe, and bring it straight back with the full width of the blade against the water. Increase the force of the pull gradually, not with a jerk. As the paddle comes to a point at your side, turn it so that the edge nearest the canoe points backward. A little outward motion, then, away from the canoe, gives the necessary side push to prevent going off course.

The side-pushing movement should be given in a way that will not tire you. Assuming that the stroke is being taken on the right side, give the top of the paddle a left and downward movement with the left hand, holding the right hand almost still. By this time the paddle blade is well behind you, the top end well ahead, the full length of the left arm. The blade now comes upward edgewise and out of the water without effort and without any drag to hinder the forward motion of the canoe. I personally allow the paddle shaft to pivot against my thigh at the end of this stroke. This adds to the ease of giving the flick or sidewise motion and helps prevent fatigue. It also has the advantage of quietness, as the shaft never strikes the gunwale.

This stroke is fundamental, and has in it the elements of all the strokes you need. If you have a man in the bow, paddling on the opposite side, so that no steering

Left, a safe way to hang on to a swamped canoe. Below, as first step in righting canoe, dunked paddler places his hands on tip of canoe and pushes downward and away, sloshing out water. He does this several times.



motion is needed, you take the same stroke but leave the "hook" off the end of the J. Turn the blade edgewise, as before, but bring it out of the water straight up with no side motion. The bow man takes the same stroke.

The strokes needed to pull or push the canoe sidewise are simple and require little explanation. To pull over toward a dock you reach out and pull straight toward you. But don't lean over the gunwale to do this. Slip the lower hand up the paddle a few inches to increase the reach. Pushing away is just the opposite.

The sweep stroke is used by the stern paddler for turning. If paddling on the right side, for instance, and a left turn is desired, insert the paddle forward and away from the canoe, pull backward and toward you in a gradual curve, turning the blade so that the inside edge is pointing forward at the end of the stroke.

To get the most power into your strokes with the least expenditure of energy, learn to use the whole body, rather than the arms alone. By holding both elbows stiff throughout the whole stroke, you can quickly get an idea of how the work can be shifted to the body and shoulder muscles.

I do not advocate doing this all the time, of course, as they do in some summer camps. I prefer to have the arms slightly bent at the elbows through most of the stroke. It is more natural and relaxed. The body bends forward to start the stroke and comes up straight at the finish; the shoulder on the paddle side points somewhat forward at the start, the other more forward at the finish. The really practical stroke is made by all the muscles that can be conveniently brought into action. To hold the body rigid and use only the arms will exhaust anyone in a little while.

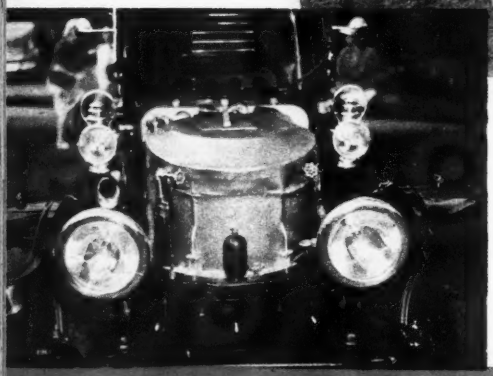
To change positions in a canoe, one person should crawl between the legs of the other.

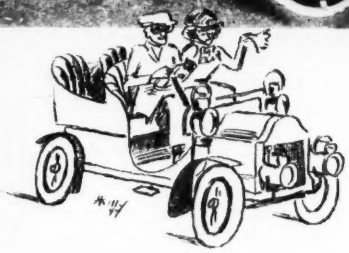
If ever you do upset you are in no great danger if you stay with the canoe. An ordinary wood and canvas canoe, even if full of water, will hold up as many men as it is intended to carry in the first place. Metal canoes are provided with air chambers and will do the same. So don't head for shore, but stick to the canoe and be safe. ●

To get back in, one person holds on to the gunwale while the other carefully pulls up, turns and slides in.

The canoe is almost entirely emptied by rocking it sidewise. Waves form and remaining water is splashed out.

This old Stanley Steamer's a lot faster than that streamlined thing you drive, Bub. Below, its famous power plant.

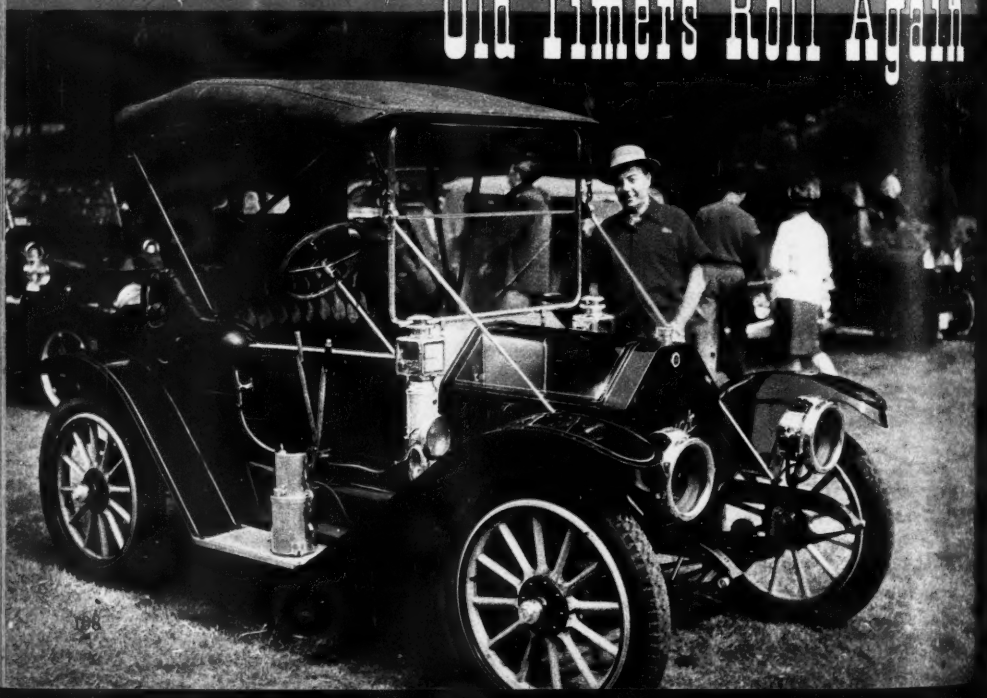




BY TOM McCAHILL

Hit of the meet was this 1911 Buick—a piece of craftsmanship to shame the thrown-together cars of today.

Old Timers Roll Again

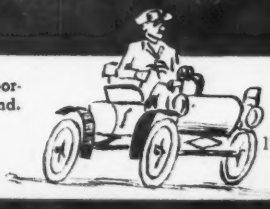


In 1914 all the sports would go a-chugging about town in nifty Packard Twin Sixes, like this.

THERE are men who collect stamps, others, works of art, still others, wives, but it is doubtful if anyone collects treasures more bulky than the members of the Veteran Motor Car Club of America, who collect old motor cars.

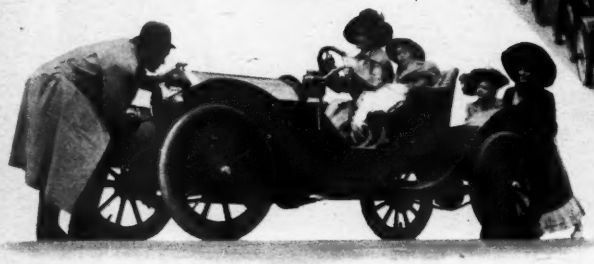
I said *treasures*. If you should drive up to one of their gatherings in a 1947 Cadillac or Lincoln and offer to swap it for one of their early gems, you'd most likely get a snicker or withering look you'd long remember. When I arrived at their last meeting at the Gipsy Trail Club, Carmel, New York, in my own new car, I felt like a guy with three heads. In that group I was just an upstart, an interloper, an automotive jerk. They were very kind, however, and tolerated me in spite of my car, even though the qualifications

This Mercer Speedster was super-super 25 years ago. Any guy who could borrow or steal one would get goo-goo eyes from every flapper from miles around.



Color photos by the Author

Old Timers Roll Again



for club membership require one to be the owner of a car not less than 25 years old and in running order.

This was the first meeting since the Glidden Tour last summer when 73 old-time cars started from New York City, heading for Detroit, and all but three finished.

I was of course much interested in the veteran cars. Perhaps the most amazing thing about them is the condition they are kept in. Every part glints in the sun, and the tons of brass horns, lights, stays and other accessories are kept shined to the blinding point. None of them has any dents or scratches and their paint jobs on the whole are far superior to any on cars manufactured today, regardless of price. Even their tires are first rate. Tires were quite a problem until a kindly manufacturer made up obsolete sizes for the owners so that they could stick to their original wheel size and not spoil anything by modernizing.

There seemed to be all kinds, shapes, models. Some were famous individuals. One of these was the Locomobile Speedster that both in 1906 and 1908 won the Vanderbilt Cup Race, the daddy of all great races. I was one of the crowd when it arrived—a 120-hp. streak that thundered once or twice around the enclosure before slowing down

Above, a long line of hic-coughing old fellows jog-ging along, spry for their age and danged proud of it.

Above left, Family. Out for **a Good Time. Father keeps a-cranking, but the cynical girls stand ready to push!**

No meet could possibly be a success without Henry's model T. Here's a vet who first rattled back in 1910.

The chain-driven Locomobile that won the famed Vanderbilt Cup Race back in 1906. It's still hot!

and taking its place among the aristocrats already on display.

Present too was a like-new specimen of the famous Stanley Steamer—the car that was so fast that its makers said they'd give one, free, to anyone who could hold the throttle wide open for two minutes on any road!

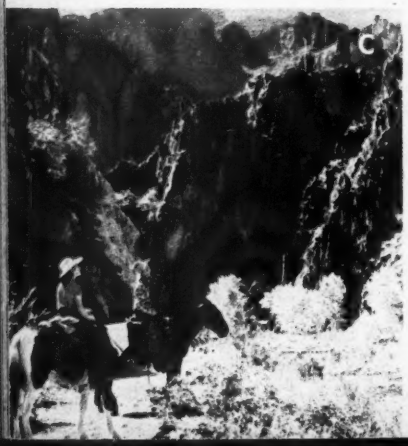
(By the way, if you should have an old-timer tucked away in some barn or garage, it may be worth a nice handful of gold. I heard one member offer another $4,000 for an ancient sport job—and get turned down cold, without the slightest show of interest.)

This writer has never collected anything but a few bad habits—but after spending two days with this group, I confess I fell under the spell of these dignified ancestors of today's streamliners and wished that I too owned one, so I could pet and admire it. •

Trooper threatens driver with ticket. Driver insists he was NOT going too slow. (Get a horse!)

Pair of 1910 Buicks, racing and standard. Also, pair of gals, racing, and pair of horses, standard.

Cash for your colors



MI's Fourth Annual Color Photo Contest
$300.00 in CASH PRIZES

ONCE again MECHANIX ILLUSTRATED offers its readers a chance to share in the $300.00 offered for the six best color transparencies or prints received before September 30, 1947.

On the opposite page are reproduced four typical pictures of prize-winning caliber. The upper photo is a flash shot reproduced from a *Kodachrome* print. The center picture, a reproduction of an *Ansco Color* transparency, is an indoor picture, obviously posed, but still and all, telling a story in a rather humorous way. The lower left hand photo is from a *Kodachrome* film, a pleasing outdoor shot. At the lower right hand, from an *Ansco Color* film, is another indoor picture, showing something doing.

The transparencies or color prints you enter need not resemble these in any way in order to win a prize. In fact, the Editor prefers that you make them as different as possible. These pictures are printed to give you an idea of the different forms of picture-taking you can indulge in. Color shots of children and animals are especially welcome.

Try and keep your shots as simple as possible with a single story-telling idea as the key motive. Color film has grown up; there is no need now to include a riot of color in your pictures just for color's sake.

Watch your background. Many color shots in last year's contest were ruled out because of a busy background that called too much attention to itself rather than to the principal subject.

You may submit as many entries as you like but in fairness to yourself you should select the best few for the judges to view. The prize-winning color transparencies or prints will be reproduced in full color as soon as possible after the judging is completed. All entries will be acknowledged upon receipt.

here are the RULES...

1. The contest is open to all amateur photographers except employees of Fawcett Publications, Inc., and their families.

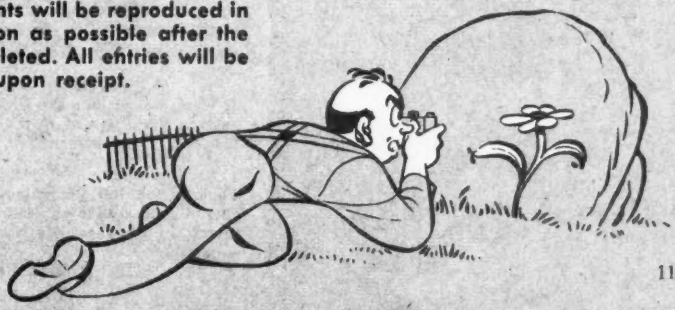
2. Transparencies or color prints of any type or size are eligible. If a color print is a prize-winner, the transparency must be available for reproduction.

3. Entries should be securely wrapped with cardboard stiffeners and be accompanied with return postage. Please identify your work with your name and address. Data about camera, film, exposure and shutter speed should be enclosed with each entry. All entries will be handled carefully and returned to contestants, but MECHANIX ILLUSTRATED cannot be responsible for entries lost or damaged in transit.

4. Contest closes September 30, 1947. Entries postmarked later than that date cannot be considered. Judges are Editors of MECHANIX ILLUSTRATED and their decisions will be final. Duplicate prizes will be awarded in case of a tie. Send your entries to the Color Photo Editor, MECHANIX ILLUSTRATED, 67 West 44th Street, New York 18, N. Y.

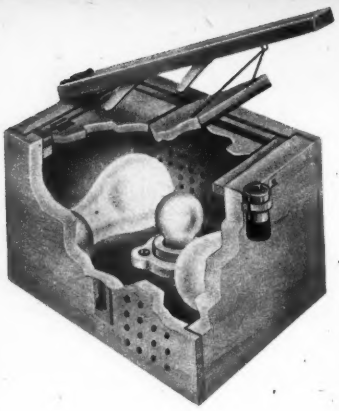
THE PRIZES

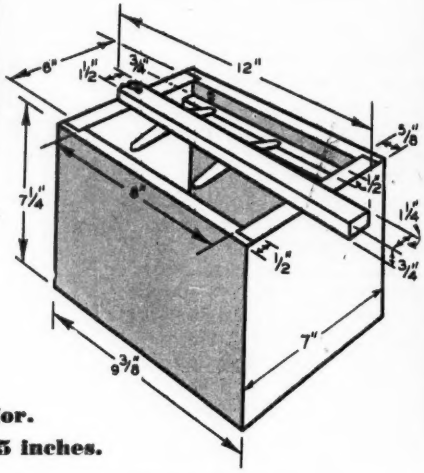
FIRST PRIZE . . .	$100.00
SECOND PRIZE .	75.00
THIRD PRIZE. . .	50.00
FOURTH PRIZE .	25.00
FIFTH PRIZE . . .	25.00
SIXTH PRIZE. . .	25.00



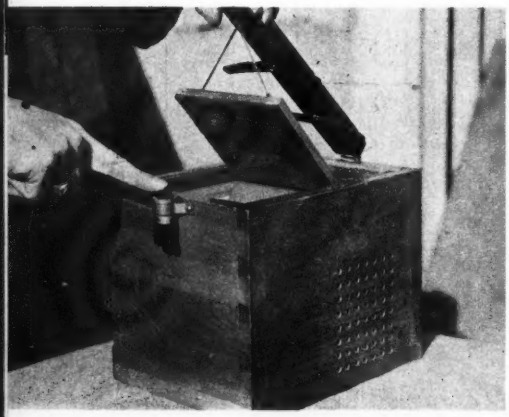
MI Contact Printer

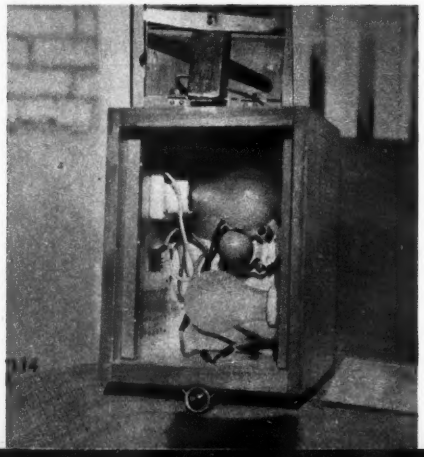
BY ROBERT BRIGHTMAN





Here is the Contact Printer that many of our readers have been asking for. Takes negatives up to 4x5 inches.





THE MI Contact Printer has been especially designed for construction with a minimum of tools. It uses as many ready-made parts as possible in order to facilitate assembly.

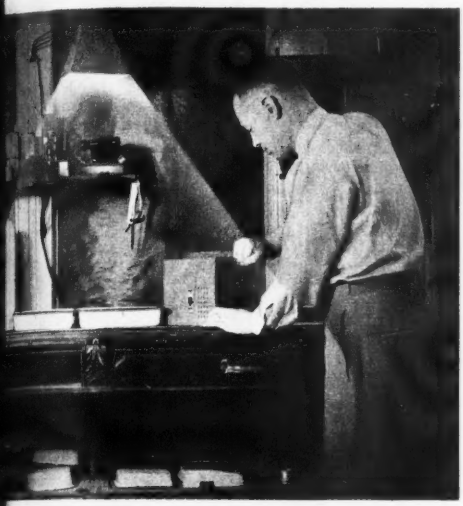
Let us start in with the box itself. This is the most important part of the printer and should be built as carefully as possible. You can use birch or maple for the stock. See the sketch at the top of the page for the actual dimensions. The original box, as you can see from the photos, was a labor of love and was put together with dovetailed joints. This is not absolutely necessary; in fact, we suggest that you stick to an ordinary half-lap joint as shown in the cutaway view.

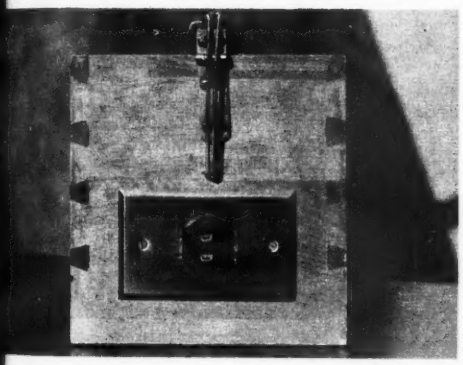
If you want to cut construction to a minimum, or if you are quite busy, or possibly just plain lazy, you can get a Kodak Auto-Mask printing frame for the upper part of the box. This printing frame has a built-in masking device. If you decide to use it, you will have to make the length and width of the box slightly wider than indicated in order to allow for the extra room required for the side bars. If

A view looking into the Printer showing how the sockets are screwed to the sides and bottom of the box. Line switch, left, controls all current.

Photo at top, left, illustrates method of supporting front hinged section of printing frame to handle by means of three eyelets and a length of string.

The Contact Printer in use. Holes in the side are shielded, from the inside, with red cellophane to form an auxiliary darkroom safelight while printing.





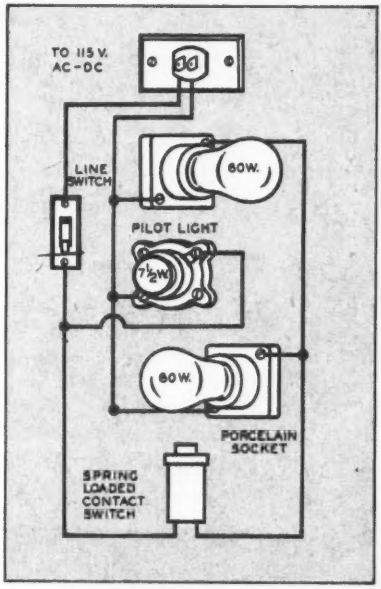
you make your prints without a white margin, then you may as well just purchase an ordinary printing frame and build your box around it or you can make the hinged section of the printer yourself. Buying a ready-made printing frame will naturally save you a little work. The box should be built so that the printing frame fits rather loosely into the top.

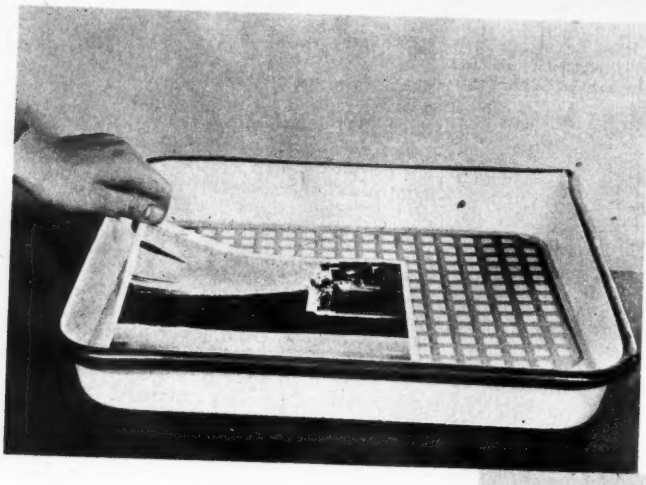
Two supports made of ½ in. square stock are screwed to each of the long sides of the box to hold the printing frame. Top of the supports should be about ¾ in. below the top of the box. In other words, when the printing frame is dropped in place, its top should be flush with the top of the box proper. Of the three porcelain sockets required, one is screwed to the bottom of the box to house a 7½-watt pilot ruby lamp. When you screw the other two sockets in place (see the inside view on page 114) make certain that the 60-watt bulbs do not touch the pilot lamp.

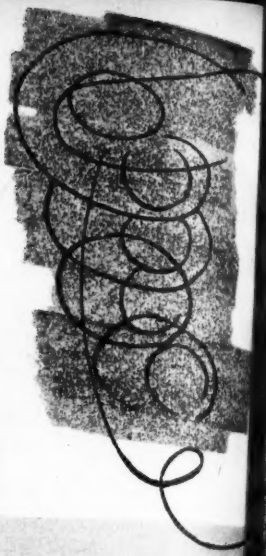
The line switch at the left of the box controls all the current. When it is pushed to "off" it will turn the pilot lamp off and will make the printer inoperative. Line current (AC or DC) is brought to the printer by means of an ordinary extension cord which is plugged into the male receptacle at back of box, see photo, below. You will note, from the wiring diagram, that a spring-loaded contact switch is required to turn on the two 60-watt lamps for the actual printing exposure. The light from the pilot lamp will not affect the paper. These switches are sometimes called momentary contact switches and are available from most electrical or photo supply stores.

The smaller section of the printing frame is attached by means of two small brass hinges to the back of the box. The next step is to hinge the long handle to the back of the box, see the photo on page 114. The spring, running from the back of the handle to the back of the box, serves to raise the front section of the printer. This front section is attached [*Continued on page* 158]

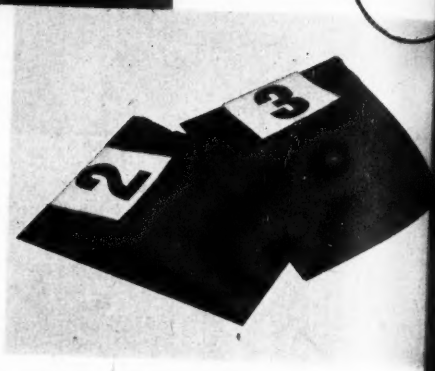
Rear view. Light spring attached to the end of the handle serves to keep the printing frame open-ready to accept the next negative and paper.







PRINTS can be prevented from sticking to the bottom of the processing trays by placing a utility or household mat at the bottom of each tray. Photos can then be readily grasped by tongs or fingers.



WHAT GRADE? To avoid losing track of the contrast grades of paper left in the black envelopes during a darkroom session, paste the contrast grade number on the flap of each envelope. Numbers cut from a calendar are ideal.

THE QUESTION BOX

By Robert Brightman

Photo fans! Use this column for answers to any of your problems on photography. If the question involves a print fault please include the print with your letter (and postage for its return).

Do you know of any formula that will intensify movie film without turning it brown? T. Budnik, Chicopee, Mass.

The only formula we know of which will not affect the color of the image is Eastman's Silver Intensifier formula IN-5. We are forwarding a copy of this formula to you.

Where can I get the strip heaters specified in the story, Automatic Heater for Developing Solutions, which appeared in the January 1946 issue of MI? Clarence L. Hoffman, Detroit, Mich.

You can get the strip heaters from the General Electric Supply Company, 585 Hudson Street, New York, N. Y.

Can I use color film in my Baby Brownie Special camera? Gerald Westbrook, Saskatoon, Sask., Canada.

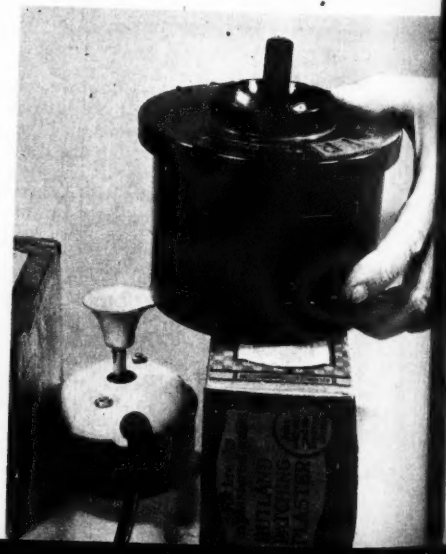
Not recommended.

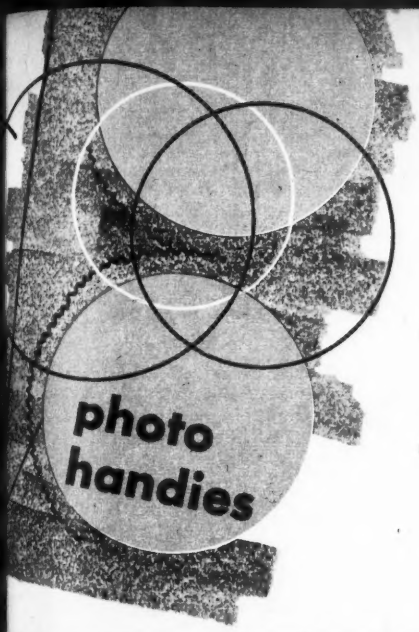
Where can I get the Ektachrome film mentioned in the January 1947 issue? R. Rodriguez Cesar, Habana, Cuba.

Ektachrome film and chemicals for processing are available from the manufacturer, Eastman Kodak Company at Rochester, New York.

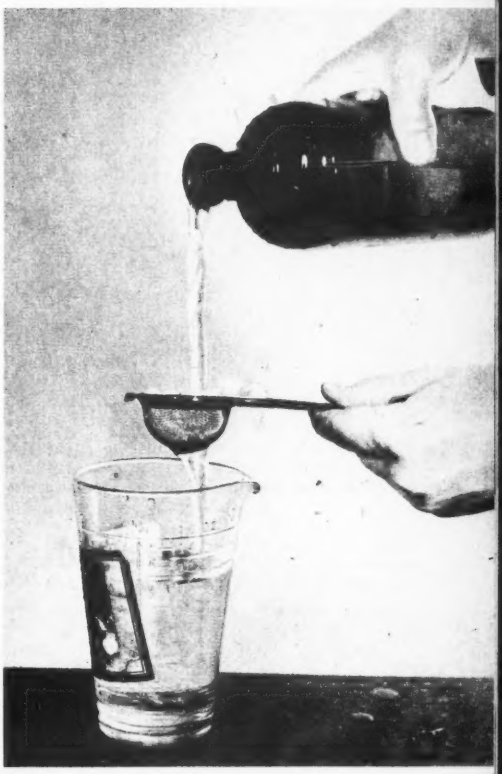
From whom can I get information about recording documents on 35mm film? J. K. Feeback, Georgetown, Ky.

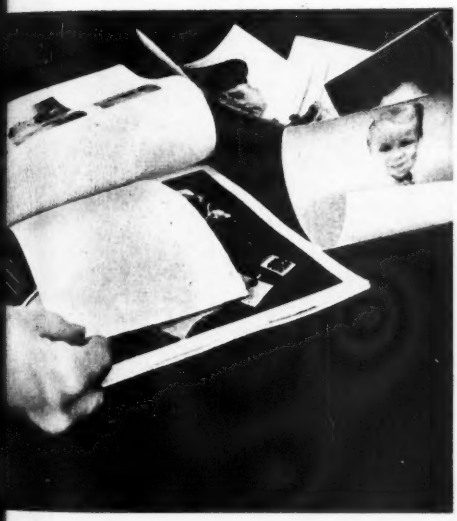
Try the Recordak Corporation, 356 Madison Avenue, New York City.





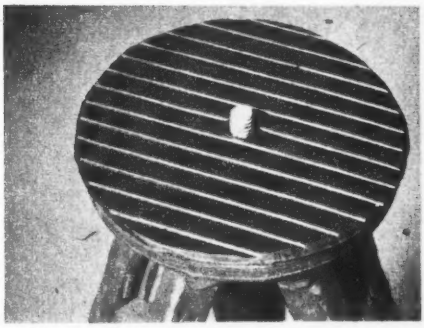
FILTERING. An easy way to strain photo solutions is illustrated in the picture below. A few layers of cheesecloth or a bit of cotton are merely placed in the bowl of a small strainer. If you use cotton, do not pack it too tightly.





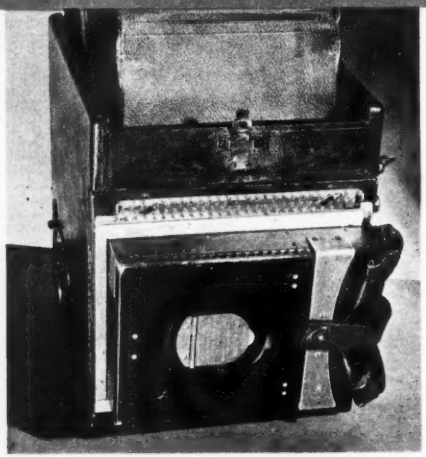
FLATTENING PRINTS. Glossy prints can be flattened by placing them separately between the pages of a magazine and then rolling them up in the direction opposite to the curl of the prints.

TRIPOD. If your camera tripod has a tendency to mar the bottom of your camera, paste a piece of stair tread rubber to the top of the tripod, as per the photograph at right.



FILM AGITATOR. Tank-developed films can be thoroughly agitated through the use of a massage vibrator. Rest the tank on a box or books so that the edge of tank will be in positive contact with the vibrating unit, see photo, left.

Graflex Film Reducer



While this unit is shown installed in a 4x5 Graflex, with slight modification it can be made to fit the back of any camera using a ground glass.

An accessory to enable use of two popular film sizes in your camera.

BY WALTER E. BURTON

IF YOU are the owner of a 4x5 camera you can readily convert it to use the smaller and more economical 3¼x4¼ film. This is a great advantage when traveling, for often the larger film is not readily available. Then again you will find that many of your shots can be taken just as well on 3¼x4¼ film.

First, measure the distance from the front surface to the film surface of a 4x5 holder. Then make a similar measurement of the 3¼x4¼ film holder that you wish to use. Usually the second measurement will be less; the difference represents the thickness of the adapter frame. In the case of the camera shown, the difference in the film-plane positions of the 4x5 and 3¼x4¼ holders was 1/32 in. Therefore, sheet aluminum 1/32 in. thick was used for the frame.

Make the outside dimensions of the frame so it will fit the camera-back opening snugly. Using strips of hardwood, make a three-sided frame enclosing sides and one end of the film holder. Thickness of these strips should be the same as that of the projecting edges of the holder. The two longer strips are of a width that centers the film holder on the frame. Outer edges must be thinned down so they will fit under the clamping strips on the camera.

The wooden end strip is the same thickness as the others but its width will depend on the exact position of the holder.

After position of the holder is determined, mark and cut out the central opening. Two strips, E_1 and E, lock the film holder in the adapter.

Use flat black lacquer to finish all surfaces of the adapter that might reflect light towards the film. Make a mask to fit over the ground glass of the camera to correspond to the area of the smaller film. •

Small nails are used like rivets to fasten the wooden strips to the aluminum frame of the adapter. Ends of nails are then cut off with a nipper.

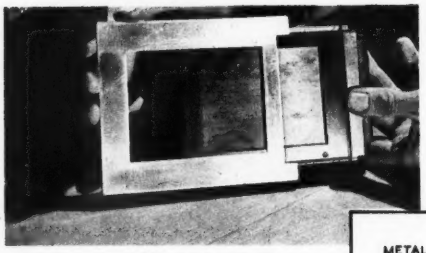
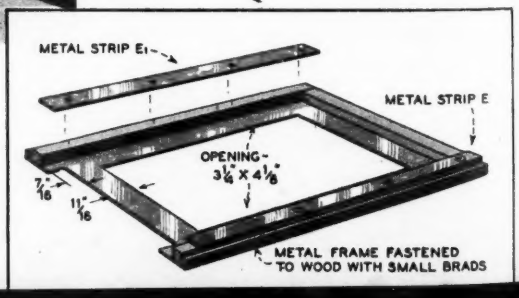


Photo shows camera side of the adapter in relation to the smaller film holder it has been designed to accept.



Please put your name, address and picture-taking data on back of each print. Wrap with cardboard stiffeners and enclose a self-addressed stamped envelope or postage for return of unused photos. Prize-winning pictures are not returned. Judges are MI Editors. Duplicate prizes awarded in case of tie. Address: Photo Contest Editor, MECHANIX ILLUSTRATED, 67 W. 44th St., N.Y.C.

First Prize ($10.00) .....Tragedy
Graflexed by Sylvia Hoffman, Los Angeles, Cal.

$5.00 Award (Below) .....Chloe
Taken with a Recomar by Robert Metz, New York.

Photo Contest

$5.00 Award .....Four Alarm Fire
Otis Finley, St. Louis, Zeiss camera.

$5.00 Award .....'Read All About It'
An indoor shot, Mal McKenzie, Chippawa, Can.

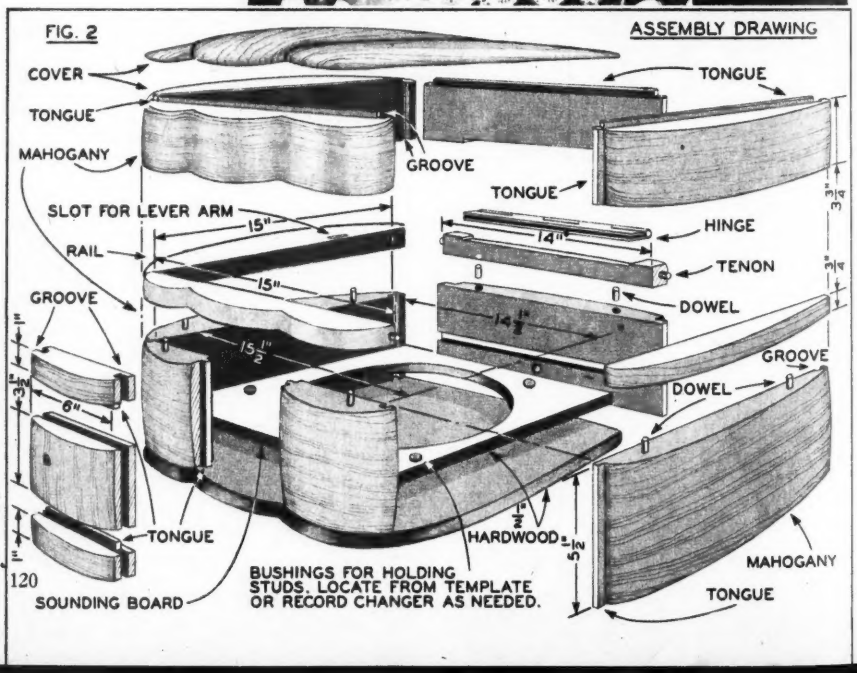
De Luxe RECORD-CHANGER CABINET

BY EDWARD R. LUCAS

Improve the appearance of your changer and the tone of the records with this hardwood cabinet.

WHETHER your taste in music is on the long-haired side or of the boogie woogie variety, the smooth lines and beautiful appearance of this cabinet will be an asset to any record fan's collection. Not only that, but the tight-fitting lid on the cabinet will help to get rid of the needle scratch that occurs when disks are played with the turntable out in the open. The cabinet that the charming miss is demonstrating has concealed tongue-and-groove construction and will take any of the more popular automatic changers that are on the market today.

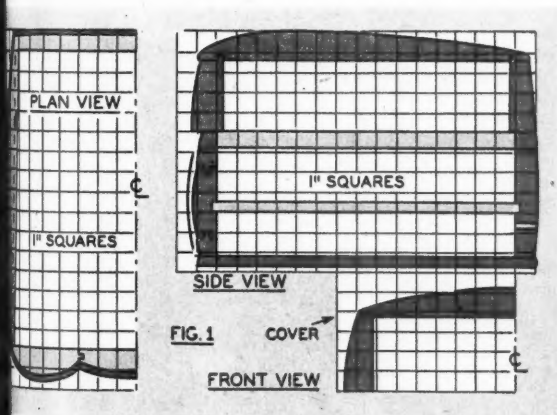
In making the body of the cabinet, your first consideration is to have the well large enough to take both 10 and 12 inch records. The dimensions in Figure 2 should be ample for this but to play safe check the requirements of your changer. Make the four side pieces of the body first. The two sides should be made



of 2 in. stock, cut and shaped as in Figure 1 and finished 5½ in. wide. Leave some stock to finish after joining so you can sand out any digs or scratches. Then cut a tongue at the forward end of the sides and a groove at the back ends, matching both pieces as closely as possible. The back piece is made in the same way and a ⅜ in. hole drilled in it for the wires. The 14 and 15 in. dimensions will actually be 14½ and 15½ in. respectively, to allow for a ¼ in. overhang of the rails after assembly. Following this, the front piece is made in five sections, the three center pieces being joined together first and then the two end sections added.

After all the body pieces are cut to shape, rabbet their inside faces to take the sounding board which is located 2¾ in. down from the top edge. Cut the board itself from ½ in. hardwood and use the record changer itself or a template furnished by the manufacturer, to get the size and shape of the inside cut-out. Then assemble the body by gluing the four sides and the sounding board together. The dimensions for the floor and rail can now be taken directly from the assembled body and these pieces cut and fit to match the contour of the sides. The floor is fastened in place with twelve 1 in. No. 8 F. H. screws, spaced three to each side and countersunk. The four pieces that form the rail are then glued and held together by mortise and tenon joints as shown in Figure 2. The ¼ in. overhang is for installation of the lever arm. The sides of the cover are made in a similar manner with a ⅜ in. overhang at the front to permit easy opening of the cabinet. On the sides and back, the cover pieces should be shaped to match the contour of the body.

The top of the cover is made in three sections joined as shown in Figure 1, with the mortise cut in the center piece. Cut this mortise *after* you've shaped the piece because it may have to be stopped a few inches short of the thin rear end to prevent breaking through the upper face. Shape all contours as close as possible to the pattern in Figure 1, with the exception of the outside edges. Leave these straight and slightly oversize to form guiding edges for cutting the groove that matches the tongue in the upper edge of the frame. When all three sections of the cover are glued together, fit them to the frame by laying it upside down against the underside of the cover and marking the outline of the tongue on it. This will give you the inside edge of the groove. Now, saw the edges of the top so each is parallel with the pencil line, leaving enough stock for shaping, later. Then cut the groove all the way around, using the parallel edge of each cut as a guide. Check the top against the frame to see if the groove fits the tongue, then finish the cover to blend with the outline of the frame. Following this, glue the top to the frame. Before joining the cover and body with a hinge, apply the finish, either clear lacquer or varnish. Locate the hinge screws carefully, install the lever arm and fasten your record changer in place. •



Concealed tongue-and-groove joints give the cabinet its smooth lines. Contrasting hardwoods should be used for the body and cover sections.

Right: Fitting the changer mechanism in the finished cabinet. The mechanism can be purchased from almost any radio or electrical supply house.

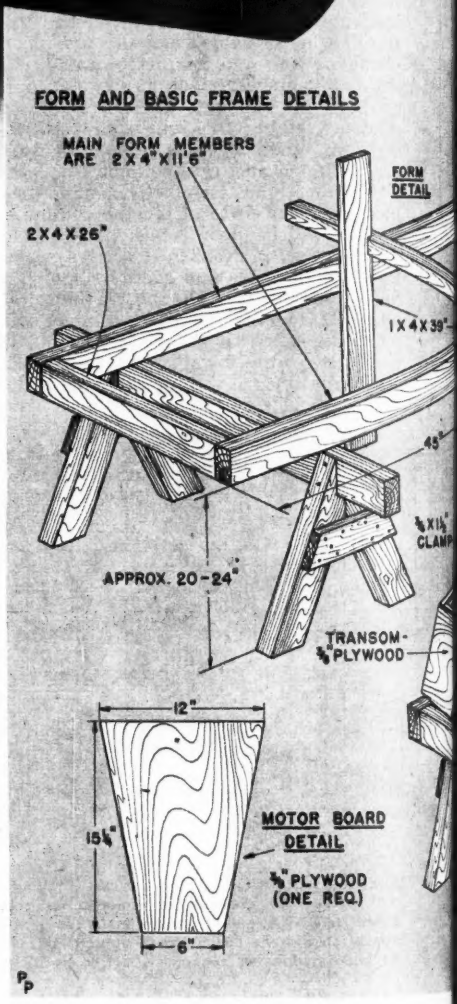
BARNACLE . . .

rides in your car trunk . . . quickly assembles to form an 11-ft. Rowboat or outboard.

IF YOU'RE looking [illegible] or camping [illegible] some lake or river within driving range, without having your car look like a moving van to do it, then Barnacle's the boat for you. She's a permanently leakproof craft that doesn't require any car-top gear for carrying or time spent in assembling a collection of frames and canvas covering. Unlike most "portable" boats, Barnacle has only three plywood sections that nest together and stow in the trunk of your car. When you arrive at the lake, they come out in a jiffy and go together as fast and easily as hanging the screens on your back porch. And once assembled and locked, you needn't worry about the sections coming apart in the middle of the lake, for they'll stay together just as tight as barnacles on a ship's hull. After the "big ones" have been caught, a few minutes' work taking the sections apart and Barnacle is back in the trunk and you're on your way home.

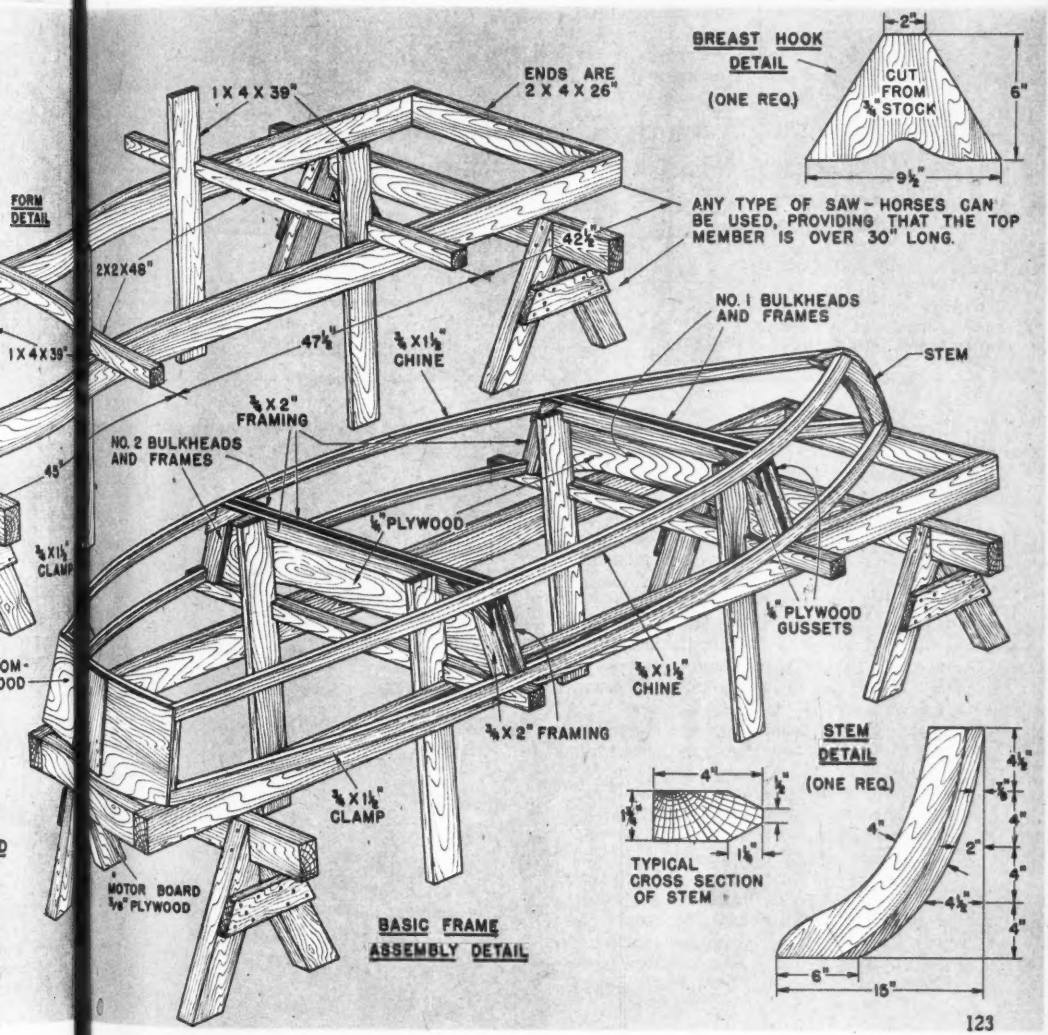
A quick check of the drawings will convince you that the construction is equally simple. The only difference between this boat and a regular flatbottom one are the two pairs of bulkheads which divide her into three separate sections. However, this difference makes it possible to build Barnacle in your basement and get her out without tearing down the wall. The reason for this is that you build the boat complete and then literally saw her into three sections, each of which is leakproof and capable of floating by itself. One more note about the construction, while you can use the reduced drawings on these pages, you'll save time and labor by obtaining the large-scale working blueprints available from the MECHANIX ILLUSTRATED Reader Plan Service.

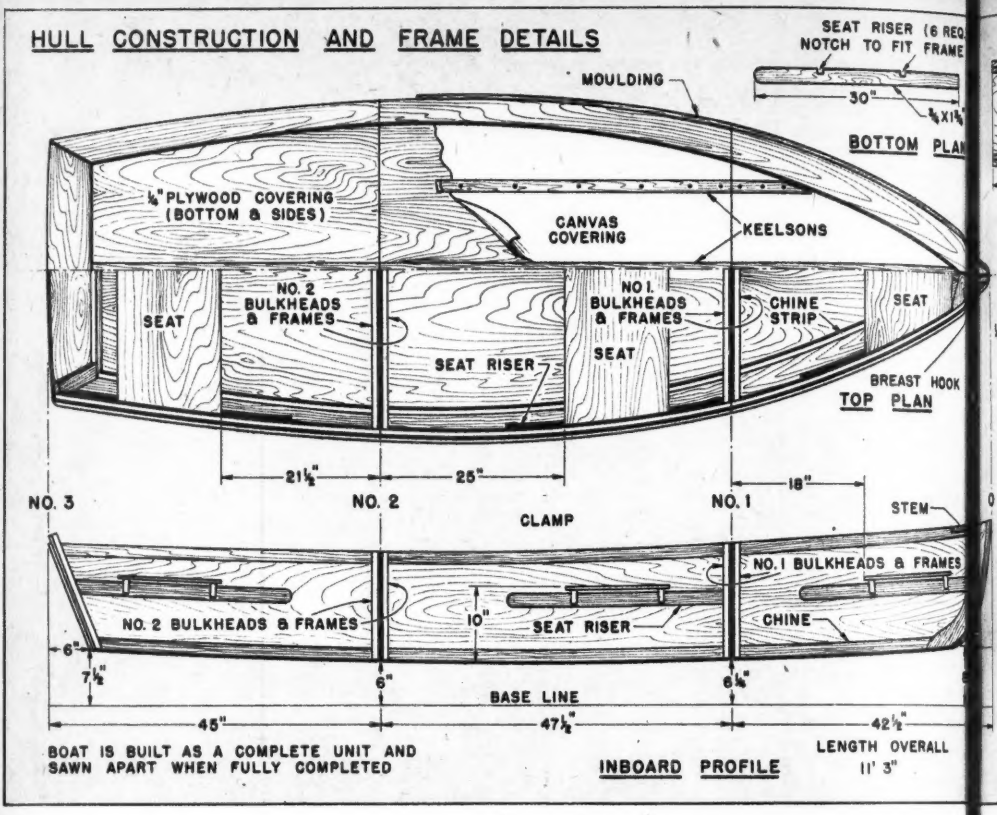
Now let's assume that you've filled the



bill of materials and are ready to get on with your hammer and saw exercising. The first step is to erect the building form, using rough lumber and following the dimensions and details in the drawing shown below. Mount the form on two low saw horses, then let it sit while you get to work on the combination bulkheads and frames, the transom and stem. Make full-size patterns for all of these by following the drawings. When they're completed, trace the stem pattern on the material and cut it to shape. In the same way, trace

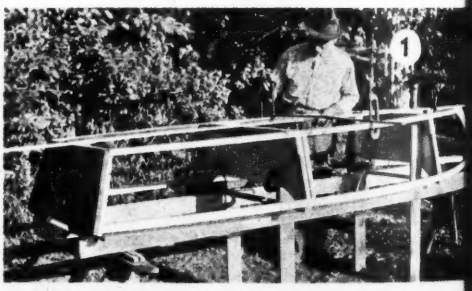
The nested sections will also ride on the bumper of a pre-war car where the trunk isn't wide enough.

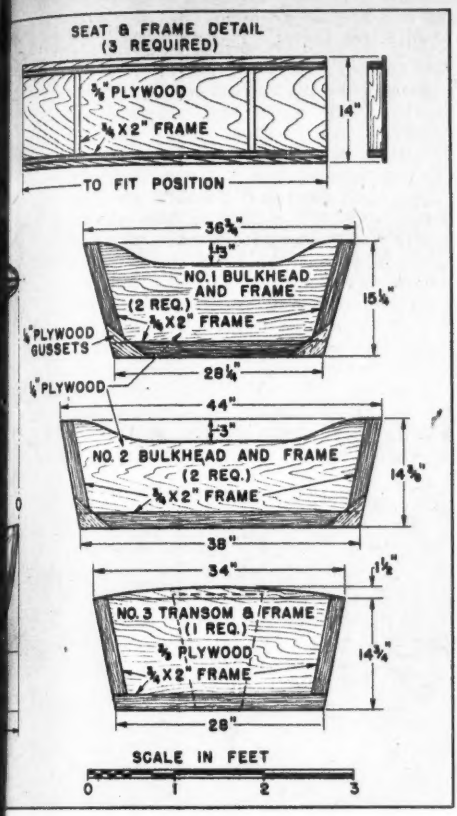




the bulkhead patterns directly on the ¼ in. plywood and cut them out. Assemble the frames and screw them to the bulkheads, using marine glue and 1 in. No. 8, F.H. screws. At the chine joints, reinforce the frames with ¼ in. plywood gussets, glued and screwed. The transom is cut to shape and the framing around it assembled in the same manner. The motor board is then cut and screwed to the aft face.

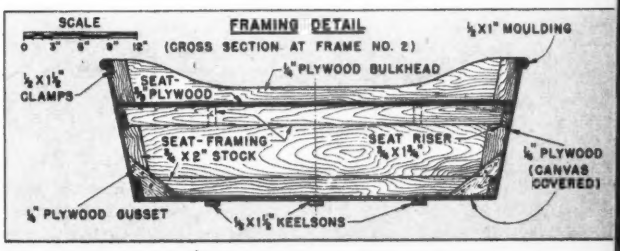
Like most of the small boats described in MI, Barnacle is built upside down making it easier to do the framing and planking. To get started on the framing, pair the bulkheads together (with the flat plywood sides facing) and temporarily fasten each pair together with screws, first inserting cardboard separators, ⅛ in. thick, so you can saw the sections apart later on. Following this, notch the tops of the four uprights in the building form and hang the two pairs of bulkheads in place as shown in the drawing. Clamp them to the uprights so they're perfectly square and true and then tack a long batten across the tops as shown in photo No. 1 on this page.





This helps to hold the stem and transom in place until the chines and clamps are fastened down. Mount the stem in the exact center of the front cross-piece and toenail it temporarily in place. In setting up the transom, bevel one edge of a strip of scrap stock and tack it across the top so that when it's nailed to the building form, the transom will be at the angle shown in the drawing labeled "Inboard Profile," on the opposite page.

The next operation is to bevel the edges of the bulkheads and frames, also the stem and transom, so that the plywood planking will lay smooth and flat. Use a long batten or strip sprung around the frames, etc., to get the correct angle of each and then plane the bevel accordingly. Don't forget to bevel the bottom of the transom. Notches for the clamps and chines are then cut completely through all bulkheads and frames but only through the framing at the transom, not through this member itself. With a sharp chisel, bevel the inside of these notches (using the sprung batten trick again) so the clamps and chines will lay flat. These members go in place next and are installed in pairs, i.e., the left and right chines are fastened down at the same time to avoid springing the bulkheads out of line. Bevel the ends of the chines where they butt against the stem and then working aft from this point, fasten them to the bulkheads and frames, using one 1¾ in. No. 8 F.H. screw at each joint

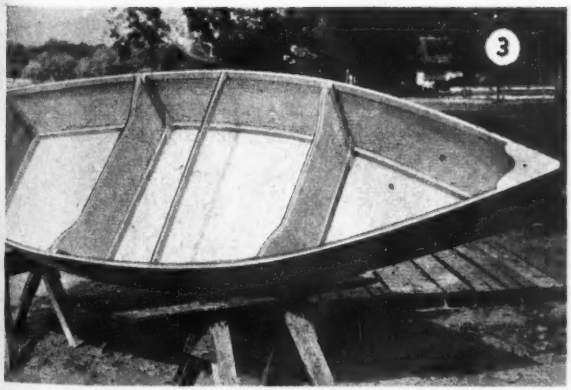


No. 1. Framing completed. Top batten holds transom and stem.

No. 2. Sides are planked in sections with ⅛ in. seam between.

No. 3. Finished hull turned right-side up, before sawing it apart.

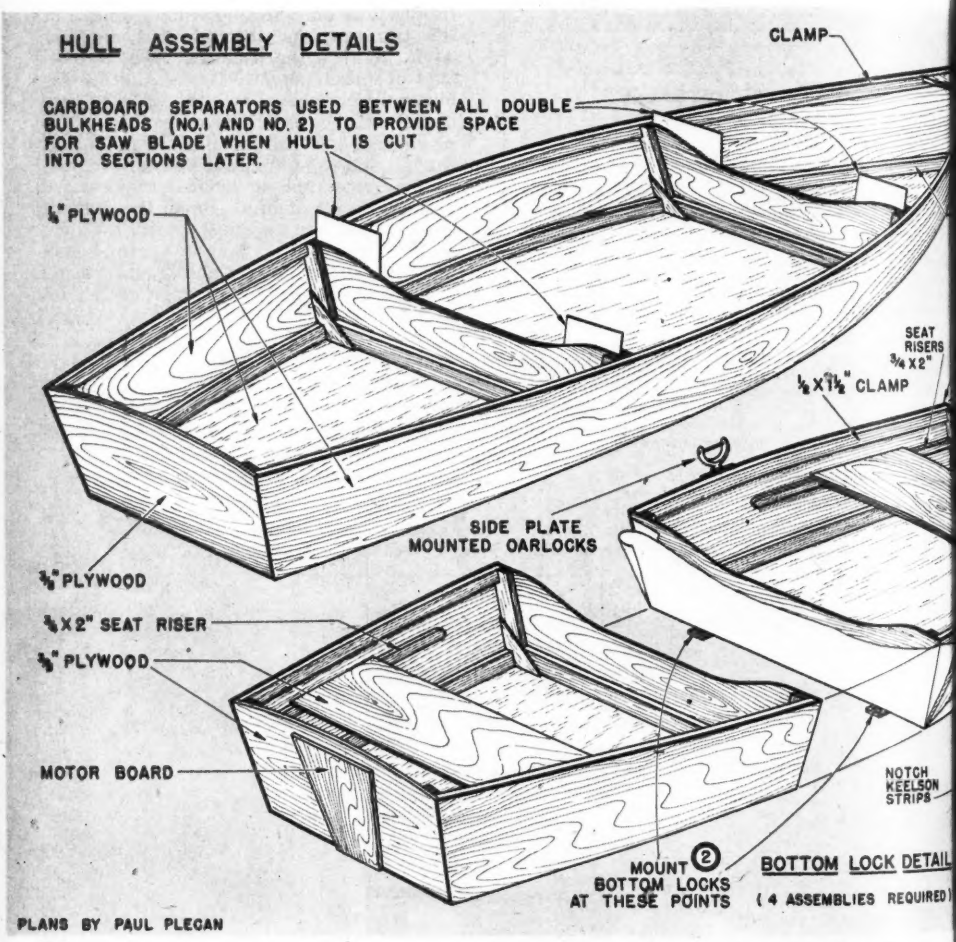
No. 4. Remove screws between frames before doing the sawing.



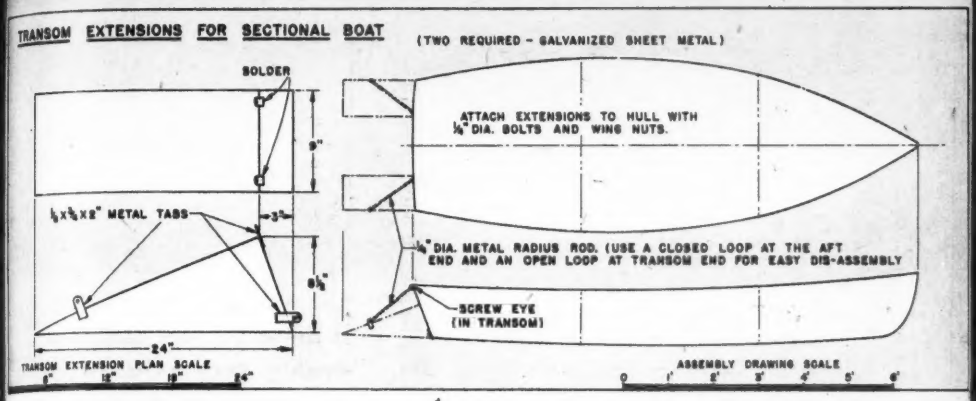
and bedding the stringer down in marine glue. The clamps are similarly installed and then both these members, the chines and the rest of the framing are trimmed and faired so the planking will bear smoothly at all points. Your boat should now resemble the drawing on page 123.

Each section of the boat is planked separately, as shown in photo 2, with ⅛ in. joints between the bulkheads (don't forget you're going to saw it apart later). Before cutting the plywood, make cardboard patterns of the areas so you won't waste any material. Coat all surfaces of the framing with marine glue and then fasten the planking in place using 1 in. No. 8 F.H. screws spaced 2 inches apart, except along the clamps where the plywood is fastened with 1 in. galvanized shingle nails, clinched on the inside. To get the most strength, the grain of the plywood should run fore-and-aft on the sides and athwartships (crosswise) on the bottom. When the glue is dry, trim the planking at all the edges, fill the seams and give it a good sanding. At the chines, stem and transom, give the plywood a slight round so the canvas covering won't wear through after it's laid in place later on.

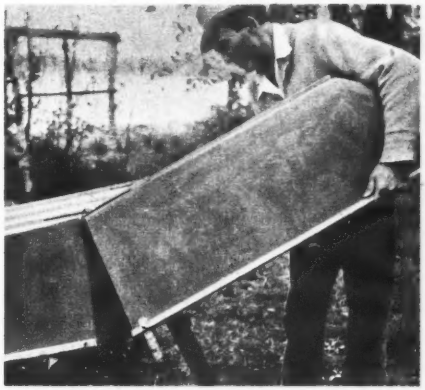
You're now ready to saw the sections apart. Before doing it however, don't forget to remove the screws that temporarily fastened the bulkheads together. With the sections separated, give them a trial nesting, then sand and round the edges of the bulkheads. Following this, fasten the seat risers to the sides with marine glue and 1 in. No. 8 screws, from

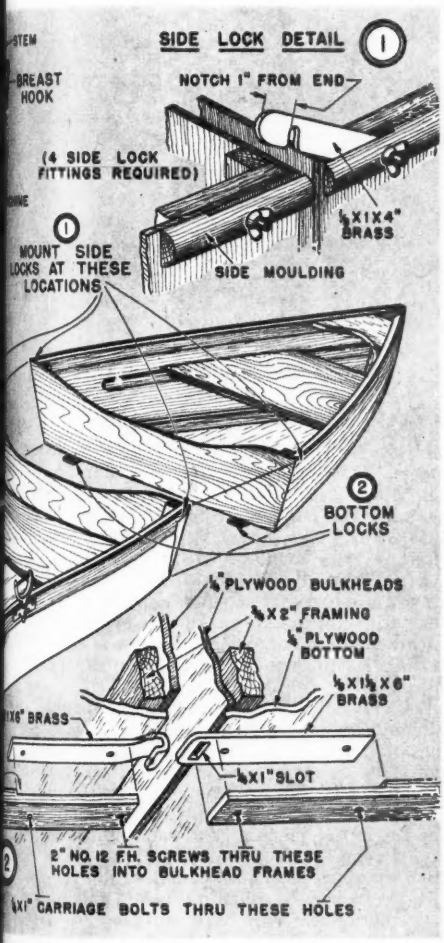


PLANS BY PAUL PLEGAN



Top: Transom extensions are for outboard use. Right: Method of joining sections together.



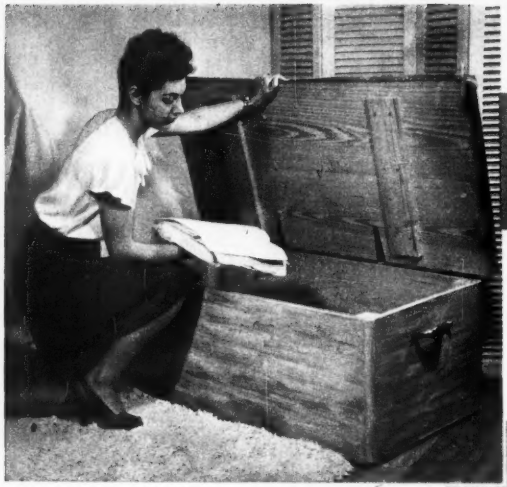


the outside of the planking. The bow seat is fastened in place permanently while the others are removable.

After all screw slots are filled with yacht-trowel cement and sanded smooth, cover each section of the boat separately with lightweight canvas. Before laying it in place, coat the plywood with a good canvas cement. Start on the bottom and smooth the canvas with a board to get complete adhesion. Leave a 1½ in. overlap at the chine and fasten the material in place with copper tacks. The edges are then trimmed and the sides covered the same way. After the cement has set, give the bottom a coat of cement, thinned with wood alcohol, then sand smoothly and apply three coats of marine enamel to all canvas surfaces.

The sides and bottom locks can now be made of strip brass, following the details shown. [*Continued on page* 158]

BARNACLE BLUEPRINTS
Large-scale prints will save time and material when you're building. Turn to page 158 for information.



STORAGE CHEST

A useful project that does double duty as a utility chest and comfortable seat

IF THE linen closet in your home looks the way Fibber Magee's sounds on the radio, then you're the man for whom this project was intended. Not only will it take the overflow of sheets, blankets, clothes, etc., from crowded closets but it will also provide comfortable seating for some of the bridge club girls when they gather in a hen session.

As you can see from the drawings, the construction is simplicity itself. There's not a dado, rabbet or fancy miter in the piece, just plain butt joints cleverly disguised by the moldings at the corners. For the stock, almost any straight-grained wood that's free of knots may be used. After you've obtained it, the first step in making the chest is to cut the front, back and side pieces to size and square them up. Then drill and countersink holes for the screws and when they're finished, glue and fasten the pieces to the corner posts. The quarter-round moldings are then nailed between the butts and planed for a smooth fit.

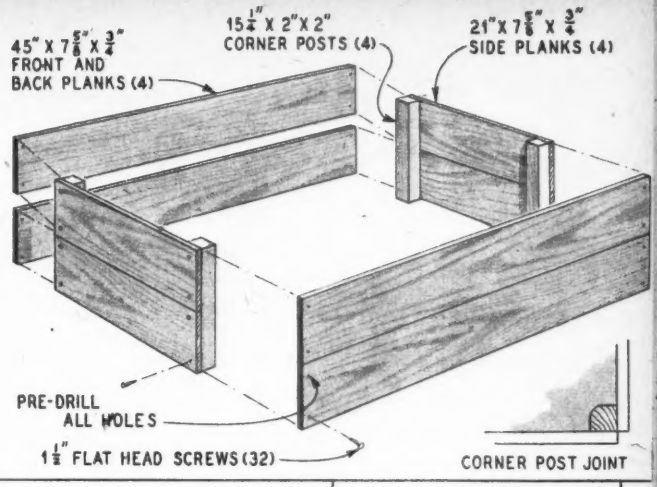
You're now ready to fasten the Presdwood or Masonite bottom in place, using glue and nails or screws. Drive six metal or rubber-covered slides into the bottom to keep it from scratching the floor. Following this, cut the two top pieces to size and fasten them together with the battens as shown in the drawing. The seat padding on the original chest was a war surplus mattress cut down to fit. If you can't get one of these, you can use regular cotton batting from the dime store or even old rags in a pinch.

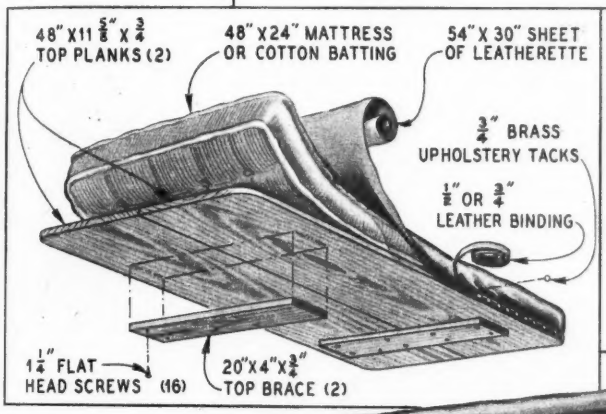
For the seat covering, use leatherette or Fabrikoid in whatever shade your wife selects. Most of the material comes in 54-inch widths, so an even yard of it will do the job. With the mattress or batting in place, stretch the material over it and tack it temporarily in place with small carpet tacks. When all the wrinkles are worked out and the corner tucks made, replace the tacks with antique, brass upholstery nails, spaced about an inch apart. Use a contrasting leatherette binding to finish the seat off.

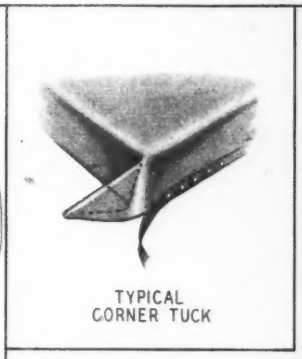
You can now attach the top to the back, using a pair of 10 in. strap hinges. The back edge of the lid should be flush while the front and sides project about 1½ in. for easy opening. The next step is to fill all nail and screw holes with plastic wood and give the entire piece a good sanding. The original chest was given an antique glaze finish by applying a coat of flat white, followed by brown blending and glazing paint, darkened with burnt umber.

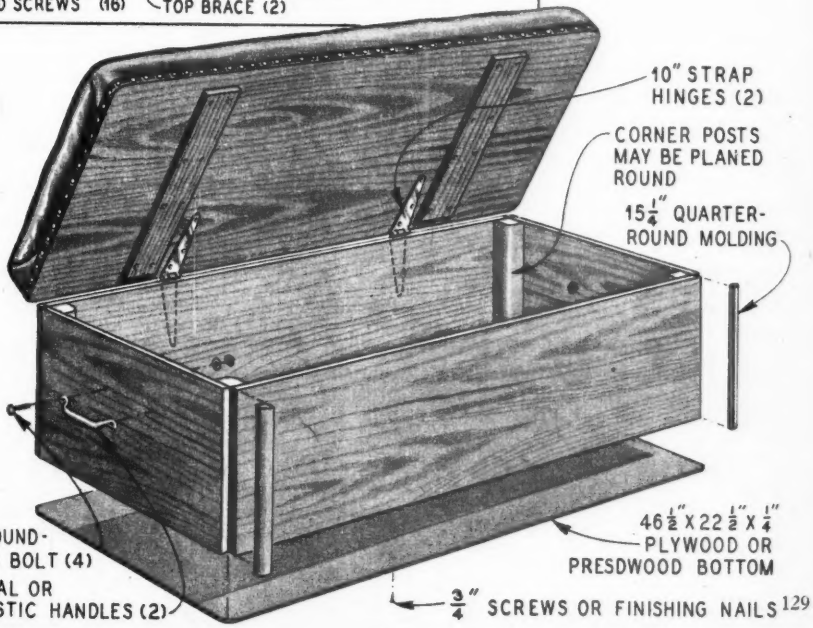
BY JACK and JAN HOLMES

All edges should be rounded to avoid snagging clothes or linens. A lid support will keep the top from falling.









how to use a circular saw

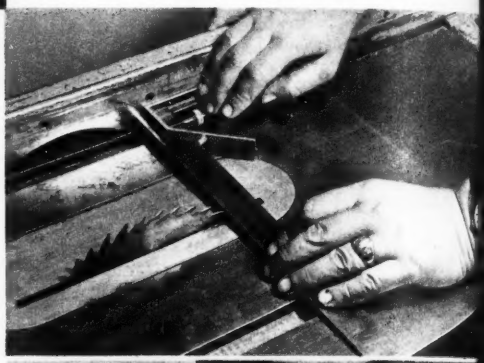
Pointers and safety hints on the handiest and most versatile tool in the shop.

BY E. WALTNER

THE pet tool of most home workshop enthusiasts is the bench saw or circular saw as it is sometimes called. The most versatile tool in the shop saves many a laborious stroke on a hand saw. Only proper alignment and handling, however, will give its owner the best results, so knowing your saw, its adjustments and observation of some simple safety rules, is just as important as owning a circular saw.

The main adjustment of the circular saw is squaring the blade to the table and fence. There may be slight variations in the construction of different makes, but in the main, the adjustment follows a similar pattern.

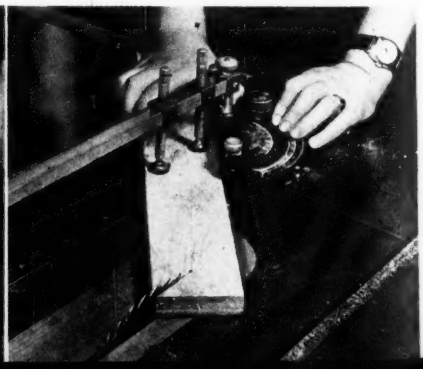
First square up the fence with the grooves in the saw table. Loosen the fence bolts, make the adjustment, then tighten the bolts. After aligning the fence with the table, check the squareness of the fence with the saw blade. To do this, measure the distance from any selected saw tooth to the fence. Mark the saw tooth and turn the blade until the tooth is in line with the table surface at the far end of the saw blade slot. Now measure again from the same tooth to the fence. If the distance is the same when measured from the forward end of the slot, the blade is square with the fence and the table. If it is not perfectly square, the table itself will need adjust-



Checking the squareness of the saw blade to the table with a try square. Bubble in the handle of the try square shows whether table is level.

Fence faced with a strip of wood prevents thin work from slipping under fence opening. Note the use of a stick to feed the work into saw.

When accuracy of cut is desired, the miter gauge clamp not only assures precision cutting but also greatly simplifies the cutting of a miter.

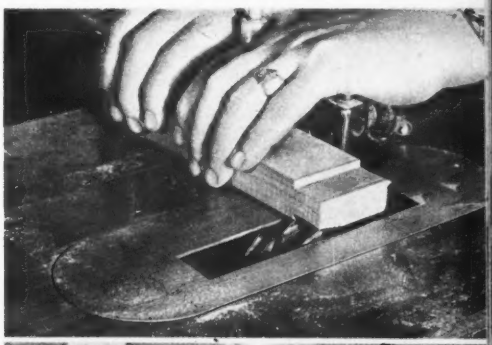


Cutting a rabbet joint. Place the front stock tight against the dado head and use the side stock to determine the position of the stop block.

Above: Making the first cut of a rabbet joint. This is a common joint used for the construction of drawers. Properly glued it is strong enough.

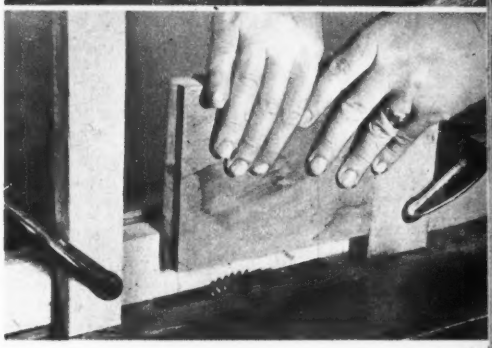
Left: The distance between a particular tooth and the fence should be the same when it is brought over to the opposite side of the slot.

Right: Cutting a tenon with a dado head. Usually the widest dado combination is used so as to cut a stub tenon with but one pass over the dado.



ment to correct the discrepancy. Tilt the table to make the trunnion screws accessible. Loosen the cap screws holding the rear trunnion, bring the table back into the horizontal position and gently tap the table with a mallet to bring it to the right position. Tighten the bolts and recheck. To assure squareness of the blade with the table, turn the blade well up and check with a square.

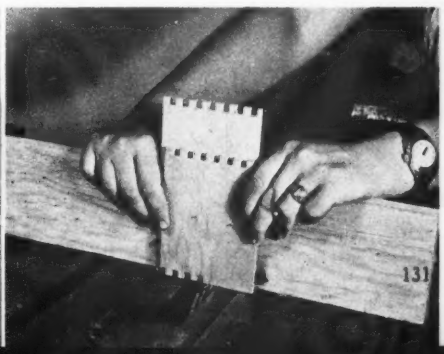
A further adjustment is the setting of the various scales so that they will read properly. Set the pointer on the tilt scale at zero. Set the depth of cut pointer to show the exact projection of the blade. Place the pointer on the fence by sliding the fence lightly against the blade and then set the pointer on the graduated front bar at zero. Check [*Continued on page* 156]

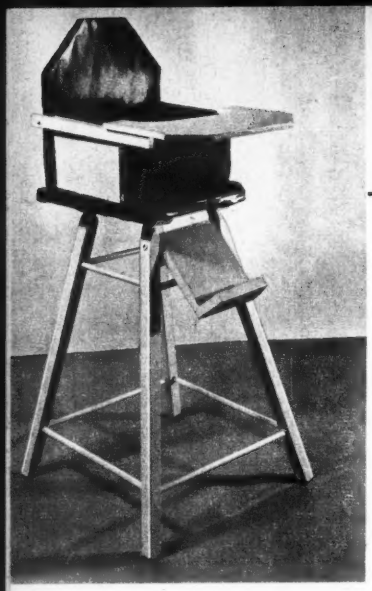


Right: An auxiliary wood fence clamped to the regular fence to facilitate the cutting of a blind dado. Note how stop blocks control length of cut.

A blind dado is a cut that does not go all the way through but stops short of one or both ends. The photograph below shows a typical blind dado.

Below: Construction of a box joint. The two pieces of wood should be kept in the same relative position throughout the entire cutting operation.



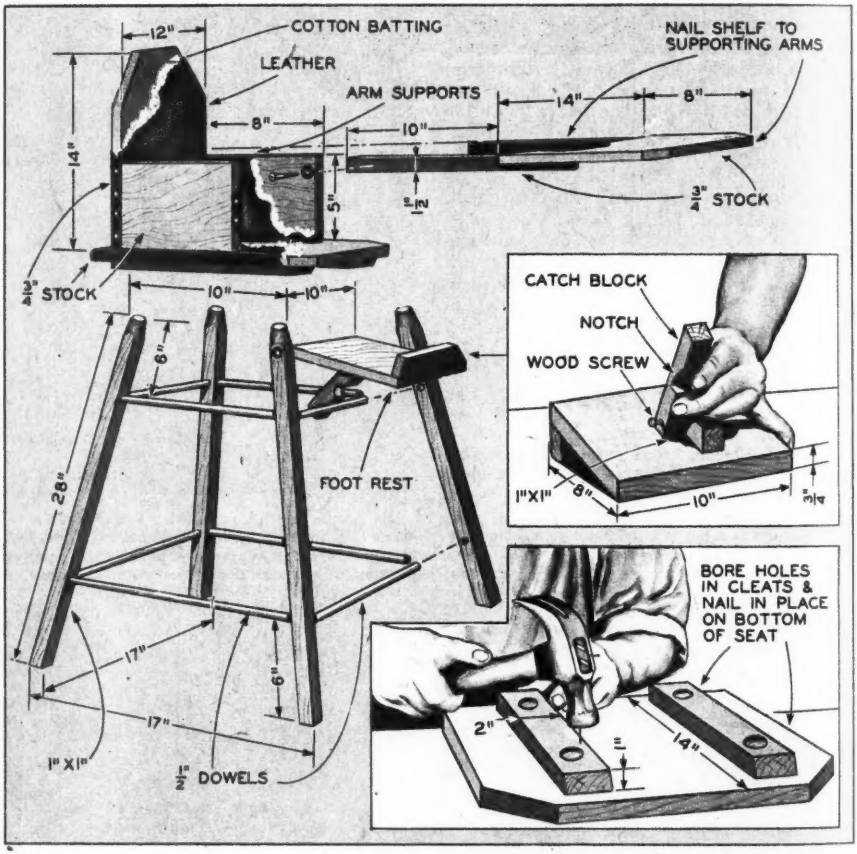


Padded HIGH CHAIR

IN THESE days of high prices and shortages, high chairs for Junior are almost as hard to get as a new car for Daddy. Here is a simply-built high chair that uses a minimum of tools and materials.

A high chair with wide-angle legs is the safest bet for an active baby so mark off four legs about 28 in. long from 1 in. stock. Lay out the front legs at the desired angle and mark off parallel lines to use as a guide in drilling holes for dowels. Dowel the four legs together, 6 in. from the bottom and 6 in. from the top. When the legs are assembled and glued, place a board across the bottom edges of the legs, mark and saw carefully so that the base will not wobble.

The back and seat are cut from ¾ in. stock and covered with leatherette. Tack the material under one edge, then stuff it with cotton batting. Pull the leatherette tightly, folding the corners, then tack it



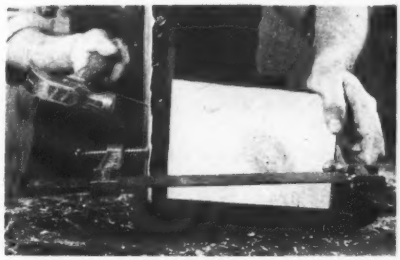
Building this chair should be fun—not work, especially if it is going to be the throne for your own youngster.

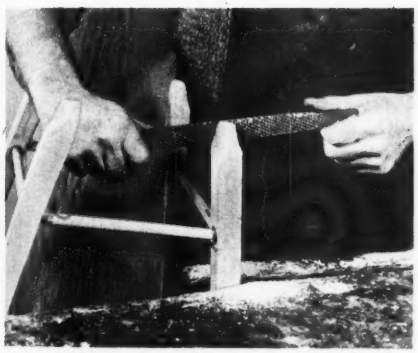
firmly with smooth-headed tacks. Cut off any surplus material.

Nail the back and seat together after they have been upholstered and nail the two arm supports in place. Seat should be reinforced with two cleats, see drawing. Bore four holes big enough so that the rasped tops of the legs will fit snugly, then nail the cleats to the seat bottom.

The shelf measures ¾x8x14 in. The foot rest is ¾x8x10 in., with a ledge for Baby's feet. The foot rest is held in place by screws passed through holes bored on the side of the two front legs. The shelf is mounted into the edges of the back so that it can be raised and lowered. The entire job is finished with two coats of shellac. •

How back and seat are nailed together. Square two boards for arm supports and nail in place.



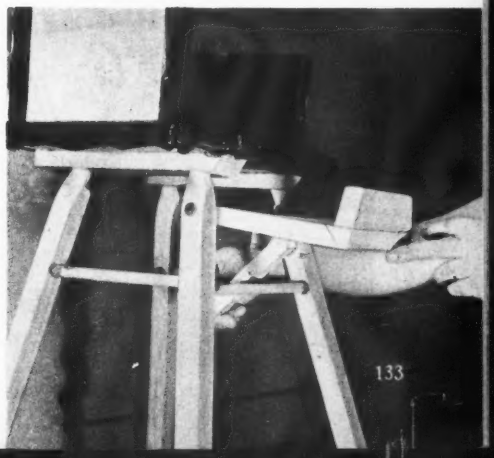


A rasp is being used to round off the top ends of the four legs. The glue used in the final assembly will take care of possible looseness.

Leatherette used for covering should be tacked in under one edge and then pulled tightly over to the other side. Fold over all corners.

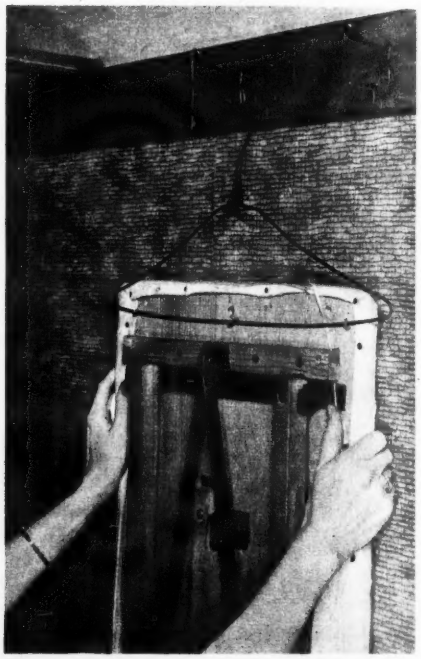
Covering the top and seat with cotton batting. This should be carefully crumbled up so that there are no lumps to make junior uncomfortable.

Holes are drilled in the top of the two front legs to pass the screws which hold the foot rest. Note the notched support for foot rest.



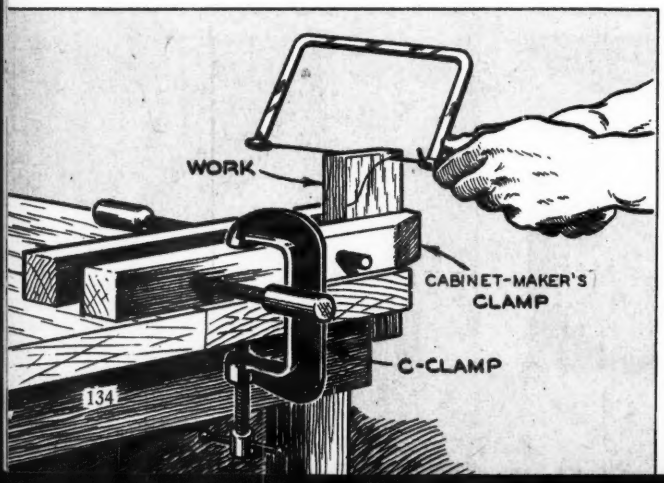
Home and Shop Kinks

SOLDERING IRON REST. A heavy cotter pin, slipped over the shank of your soldering iron, makes a convenient and ever-ready rest. The pin should fit loosely so that the legs will always point down.



IRONING BOARD STORAGE. Three staples plus a sturdy wire coat hanger are all you need to hang up the ironing board when the missus is through with it. Staple the hanger to the wide end of the board so that the legs hang down. The wire hanger should be loose enough so that it will drop down, out of the way, when the board is being used.

TABLE PROTECTOR. Many cosmetic preparations are equipped with plastic lids which are usually discarded when the jar is empty. Save them. They can be used as attractive plant and tumbler coasters.



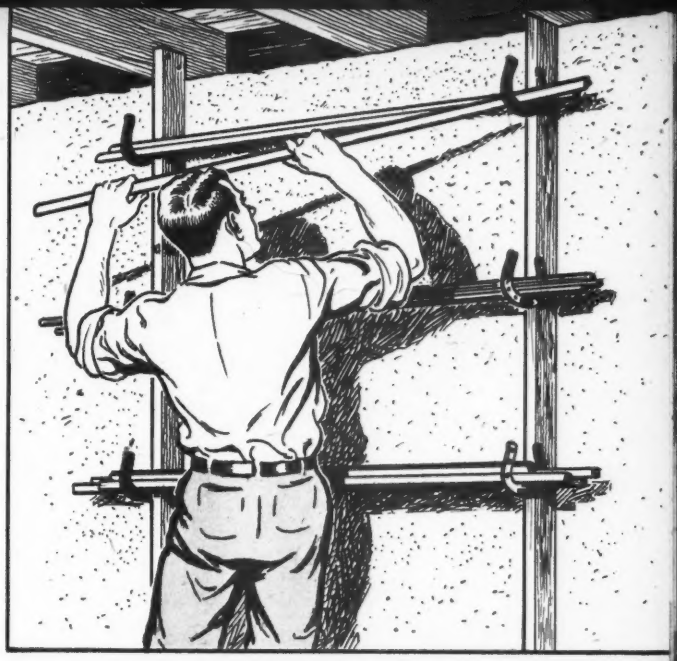
EMERGENCY VISE. A cabinet-maker's clamp secured to the table with a C-clamp can serve as an emergency vise for holding work to be sawed or filed.

The parallel jaws of the clamp can be swiveled in any direction, with the work undisturbed, by merely loosening the C-clamp.

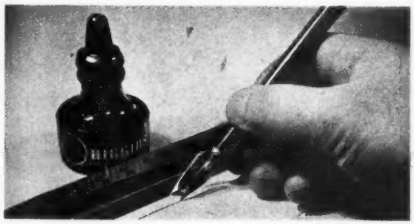
Mechanix Illustrated

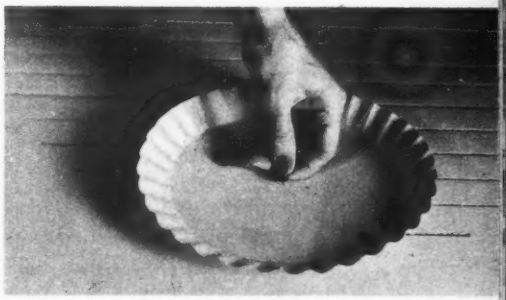
DOUBLIN' ON DOBBIN. If you are a horseshoe pitching fan then you know what to do with worn-out horseshoes. But if you are not, and hate to discard Dobbin's footgear, then try this in your cellar or workshop.

Nailed to posts, horseshoes make excellent racks for storing odd pieces of moulding, fishing poles, metal tubing and similar items.

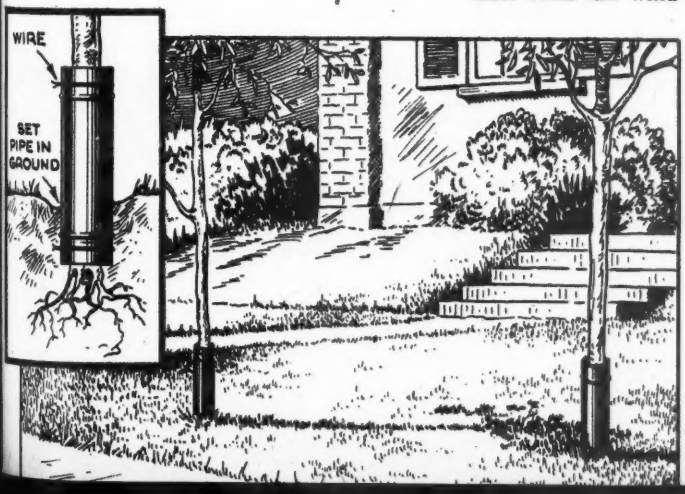


DRAWING LINES WITH INK. An ordinary pencil clip, attached to the bottom of a pen, will enable you to draw ruled ink lines without the possibility of the ink running underneath the ruler. Just rest end of clip against the edge of the ruler.





PICNIC PROBLEM SOLUTION. A thumbtack through the bottom of picnic paper plates will anchor your dinner to the table come fair wind or foul.



TREE PROTECTOR. Lengths of old stovepipe placed around the base of young trees will protect them from being injured.

Pipe should fit loosely around the tree to allow for growth. Lined with excelsior, they also serve to protect delicate trees in the winter.

NIEUPORT Scout

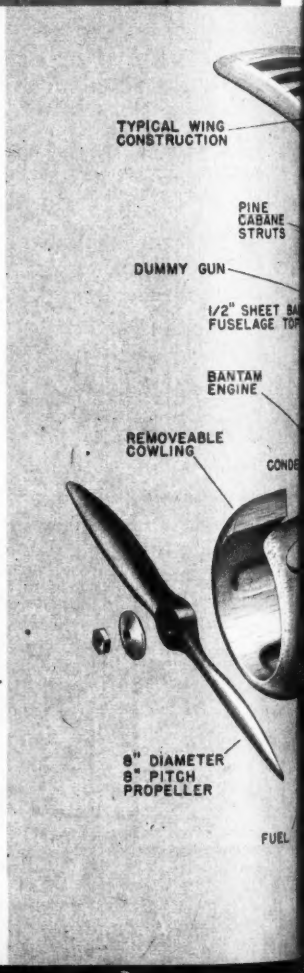
BY CALHOUN SMITH

Interested in historical scale gas models? Then build and fly this 27-inch control-line version of World War I's most famous "polo pony." Takes engines up to .30 displacement.

ONE of the great planes of the World War I was the French Nieuport Scout. Used by the French, British, and later the Americans, it gained a fine reputation for fighting ability. France's foremost ace, Georges Guynemer, won most of his 53 victories flying the Nieuport. Canada's famous Billy Bishop flew a Nieuport in the early part of his career and a good portion of his 73 kills were made in this plane.

With only 110 hp, the Nieuport had a top speed of about 107 mph, not much when compared to present day fighters. Nevertheless, the Nieuport had excellent maneuverability. Firepower at first consisted of a single Lewis gun mounted above the wing to fire outside the propeller arc but after the interrupter gear was perfected to permit firing through the prop, one or two Vickers machine guns were carried on the fuselage.

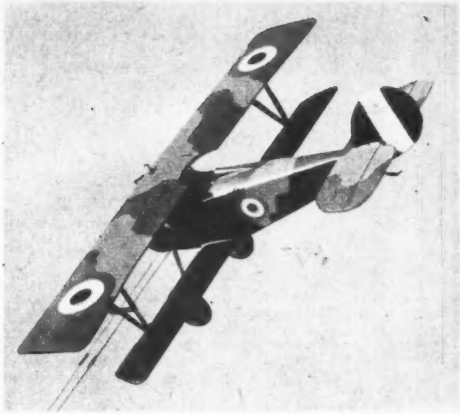
Rotary powered (the cylinders and crankcase revolved *with* the propeller), the Nieuport had the undesirable characteristic of terrific torque common to all planes using rotary engines at the time. The engine had to be



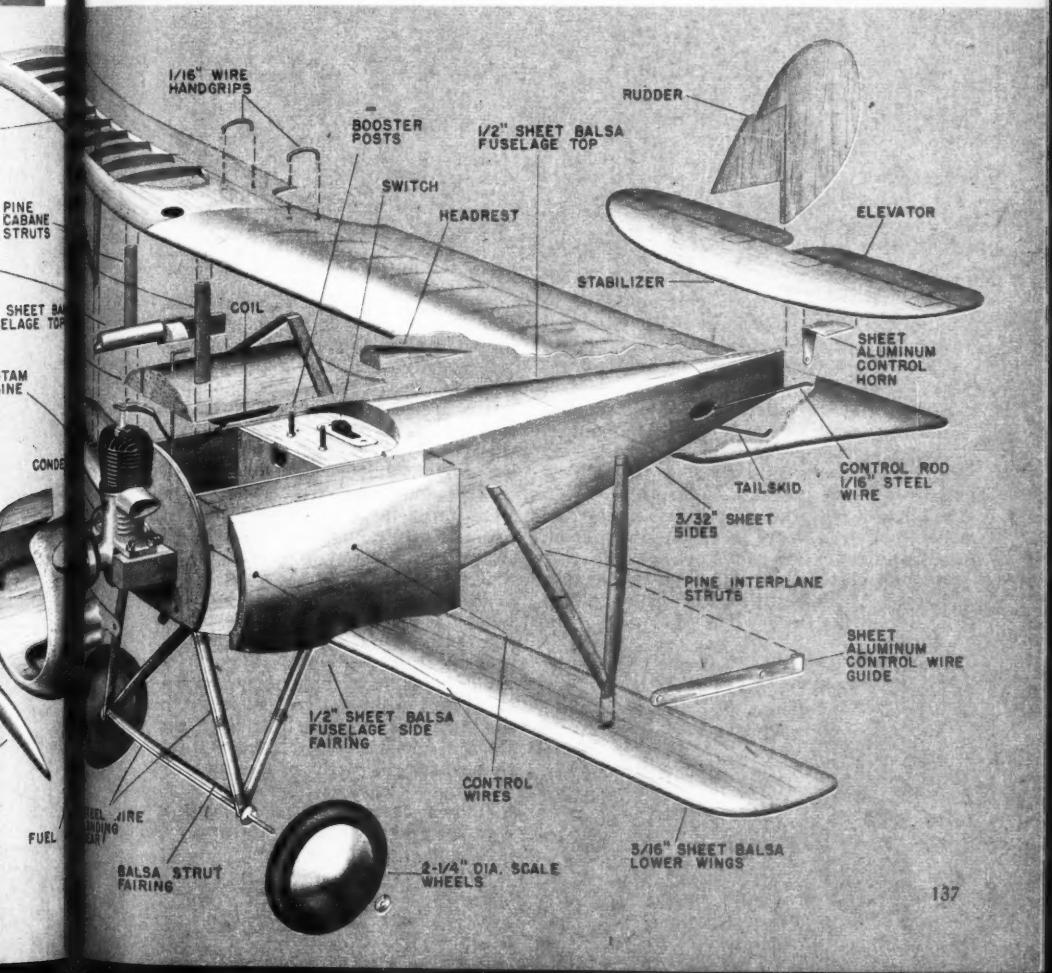
"blipped" on a landing approach to maintain flying speed and this alternate torque and lack of same caused extremely tricky landings and often serious accidents.

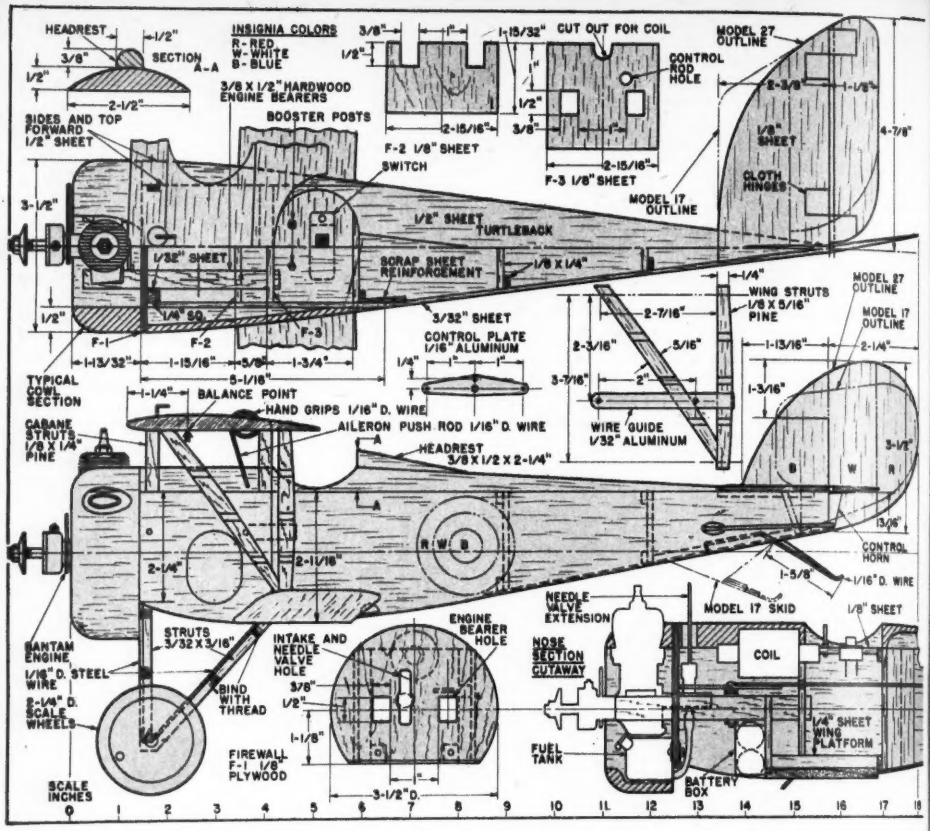
Many modifications and changes occurred during the Nieuport's development. The accompanying plans include notes on the early Model 17 outlines. This particular version probably achieved the greatest fame because of the men who flew it. MI's model incorporates the changes made in later Model 27.

Built to a scale of 1 inch = 1 foot, the resulting 27 in. span model has flown well and, although rather small, the large wheels enable it to get off rough sod fields. In the air it handles easily and makes an excellent stunt ship. The original job was powered with a Bantam engine but any powerplant from .099 to .30 cubic inch displacement can be used. Of course, structural changes in the nose will be necessary.



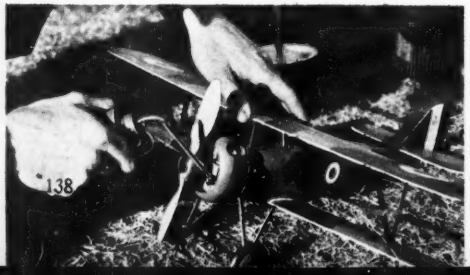
Dressed in 1918 war paint, the model is easily mistaken for the real thing, stunts equally well.

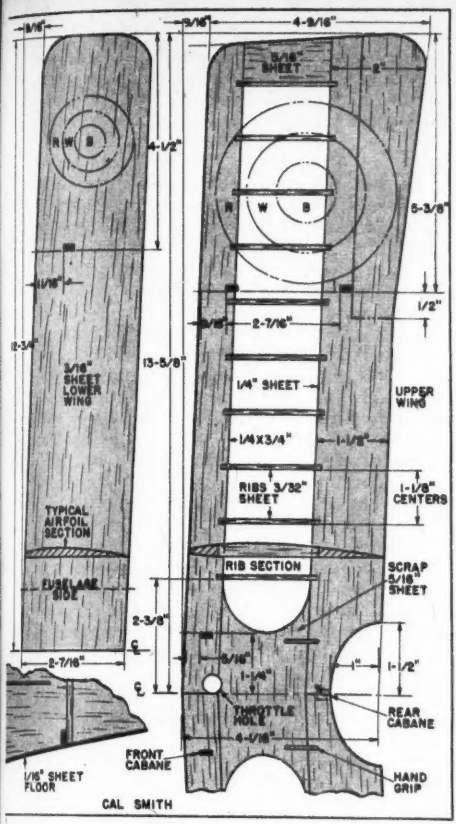




The fuselage is comparatively easy to build and consists of sheet balsa sides and bottom, with the curved portions being carved from medium ½ in. stock. First trace the side view outline on a sheet of 3/32 in. medium stock and cut out, making certain the front edge is absolutely square. Use this finished side as a pattern and duplicate the second fuselage side. Now mark off the position of bulkheads F-2, F-3 and the three built up formers and then cement a hard piece of ¼ sq. stock to the extreme front edge of each side. Cut out bulkheads F-2, F-3 and the engine bearers. At the point indicated just behind the cockpit, lightly cut and crack each sheet balsa side to form the top view taper shown. Check the angle by placing each half directly over the plan. Pin and cement F-2 and F-3 to the sides and then tack this sub-assembly upside down directly over the top view, letting the front hang about ½ in. over the edge of your workboard. Now slide the firewall on the engine bearers and then carefully insert and cement the bearers to bulkheads F-2 and F-3. Pin and cement the tail ends together and then build up the rear formers, as shown. Insert the ¼ in. sheet lower wing platform resting on F-2, add the reinforcement for the tail skid and then bevel two pieces of ⅛ in. scrap to reinforce the cracked fuselage sides. Now cover the rear bottom portion of the fuselage with 1/16 in. sheet and, after the cement has dried, remove the entire structure from the plan. Cement the tail skid in place, add the ⅛ in. sheet stabilizer platform and then trace and cut from ½ in. stock the top and side pieces that form the curved portion of the fuselage. Spot-cement these pieces to the fuselage and carve the exterior.

Refueling before a flight. A "squirt" can, obtainable from any hobby shop, does the job in a jiffy.





Former AAF pilot, author-artist and just plain model builder Calhoun Smith displays the Nieuport.

After each block has been sanded, cut it away and hollow out as indicated. Note that the block forward the cockpit is only hollowed out to accommodate the coil. Do not cement this block in place until after the wiring has been completed. Next, drill the hole for the control plate bolt in the left engine mount and assemble the control plate rod and line leads. Finally, install the control system in the fuselage.

Bolt the engine in place and drill the hole in the fuselage top for the needle valve extension. An Eagle or similar penlite battery case will just fit into the cramped quarters and is cemented directly against F-2. Complete the wiring, check the circuit and cement the fuselage top in place.

The cowling is of solid balsa cut from a 3½ in. square x 1½ in. thick piece of stock or else built up of smaller pieces. Saw out the inside ring, shape the exterior and then cut away for the cylinder, exhaust stack, condenser and tank. Hold the cowl in place with dress snaps or hooks and rubber bands.

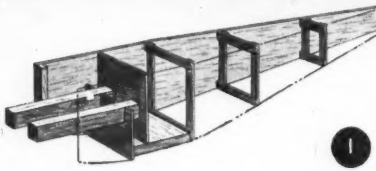
The landing gear is now bent to shape and fitted to the firewall with aluminum strips and two bolts, but do not install until after the lower wing has been attached. The fuel tank is made from a medium battery shell, as shown. If the Bantam engine is used, the needle valve body should be held to the intake pipe with a nut on the bottom in place of the regular threaded tank top. The bottom of the fuselage forward the wing, may be left open for easy access to the batteries or else fitted with a removable hatch.

The tail surfaces are next. Trace the one piece stabilizer and elevator half outlines on the prescribed stock and carve to shape. The plan contains the popular cloth hinge method but your favorite system can be used. Attach the control horn, checking the connection with the control rod for elevator travel before cementing the stabilizer permanently to the fuselage. The elevators should be neutral while the control plate is neutral. Trace the rudder outline, shape the surface and finally cement it to the fuselage.

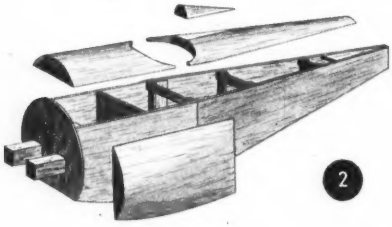
The lower wing is made in two halves and cemented to the fuselage at the indicated angle. Trace, cut out and shape each panel and then mount on the fuselage block, which should first be carved to fit the camber of the wing. The upper wing is built in two halves and then assembled, the solid center section insuring a good joint. First trace the outlines of both the leading and trailing edges on the prescribed stock, carve each edge roughly to shape and then notch for the ribs. Pin the edges for the right half directly to the plan and cement the ribs and solid tip in place. After the cement has dried, remove the panel and proceed to build the left half in exactly the same manner by either tracing a left half outline on a separate piece of paper or else turning over the plan. After both halves are completed and sanded, join by cementing the solid balsa center section in position.

Perhaps the most difficult part of this project is mounting the upper wing. The outboard V struts should be cut to shape and the bottom joint cemented together over the plan. Carefully cut out the holes and notches, cement the V struts to the top wing and check alignment while the

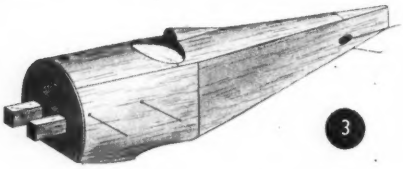
FUSELAGE CONSTRUCTION



Cutaway view in the early construction stages. Fuselage is built upside down directly over the top view plan. If necessary, vary the width of the motor bearers to fit your particular power plant.



After the motor bearers and front bulkheads are in place, cut the rough blanks for the curved sections, spot-cement in place and then carve to shape. Finally, remove and hollow out as shown on the plan.



Before cementing the curved blocks permanently to the fuselage, install the control system and complete the wiring. Note that the bottom is cut to fit the camber of the lower wing, which is attached after the tail surfaces are secured.

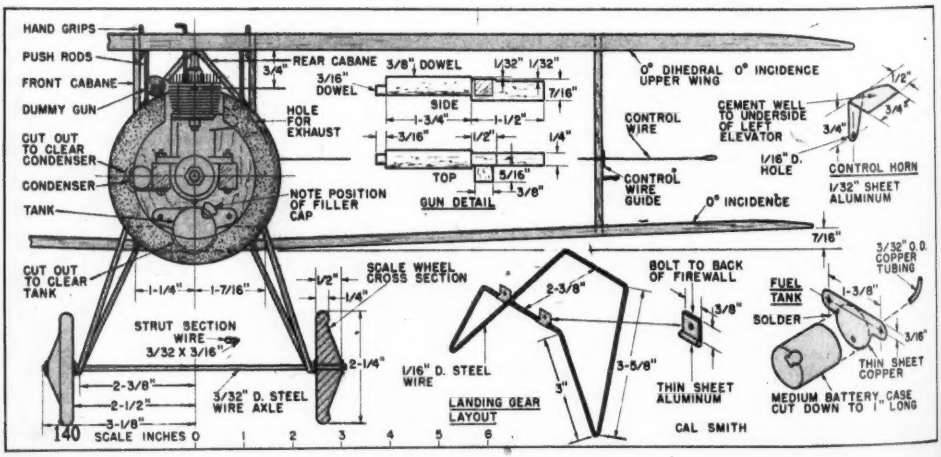
cement is drying. The cabane, or fuselage struts, are now cut to shape and cemented in the fuselage top.

After the cement has dried, cut holes in the lower wing for the V struts and holes in upper wing for the cabane struts. Position the upper wing but do not cement until the alignment and incidence have been checked very carefully. Then cement the upper wing down and let dry thoroughly. The entire performance and appearance of the model depends on the above operation.

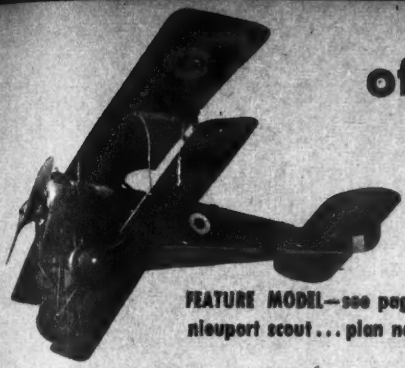
After the model has been completely assembled, the wood surfaces should be covered with Silkspan or light tissue. The landing gear is now permanently fixed in place. Groove the bottom surface of the lower wing to fit the rear portion of the landing gear. Use cement liberally and add four bent pin staples.

The original model was camouflaged, with irregular patches of light green and buff on the top surfaces of wings, tail and fuselage sides. The underside was doped light blue. Vertical red, white and blue stripes decorate the rudder. The French or British insignia is located on upper and lower surfaces of top wing and bottom of lower wing.

Balance your model at the point indicated on the plans by adding lead to the tail, if necessary. We were quite fortunate because no adjustment was necessary. The test flight, on 35 ft. lines using 8 and 8½ in. high pitch propeller, resulted in a jump takeoff not unlike a bullfrog making for the far bank. Speed was good and flights made in winds of 20 to 25 mph. again showed no roll tendencies. The exceptional handling qualities more than fulfilled the original hope for a good flying scale model, and we're certain that this model will be a welcome historical addition to your hangar as well as a downright pleasure to fly!



off to a *flying start*



FEATURE MODEL—see page 136
nieuport scout . . . plan no. 379

When you build your next gas job from any of these full-size Mechanix Illustrated feature model plans, you're in for greater satisfaction in model building and flying. There's no guessing or improvising because each model is designed by a leading authority and thoroughly test flown before it is featured in Mechanix Illustrated. Just follow the explicit step-by-step instructions, study the perspective and exploded views, and build right from the full-size diagrams. Chances are your finished job will look just like the photographs of the original model shown on every plan.

Your local model or hobby dealer can supply you with any of the MI plans as well as the specified materials needed. But if your choice is not in stock, send 50c with the name and number of the model you want to MI Reader Plan Service, Fawcett Publications, Greenwich, Conn.

sharkie . . . plan no. 377
22 in. span, for .60 engines

skysedan . . . plan no. 372
36 in. span, for .19 to .60 engines

DEALERS: MI plans are real profit boosters for greater sales of model engines and allied materials. Take care of the demand in your shop by contacting your hobby jobber, or write direct to Dealer Plan Service, Mechanix Illustrated, 67 West 44th Street, New York 18, N. Y., and we'll contact a leading jobber for you.

pylon buster* . . . plan no. 373
6½ foot span, for class C (.60) engines

mr. mulligan . . . plan no. 374
39 in. span, for .29 to .60 engines

p-47 thunderbolt . . . plan no. 375
20 in. span, for .09 to .23 engines

*free-flight—others control-line

Watch for this package at your hobby shop. It means MECHANIX ILLUSTRATED plans . . . the latest and best in gas powered model airplane plans. Only 50 cents

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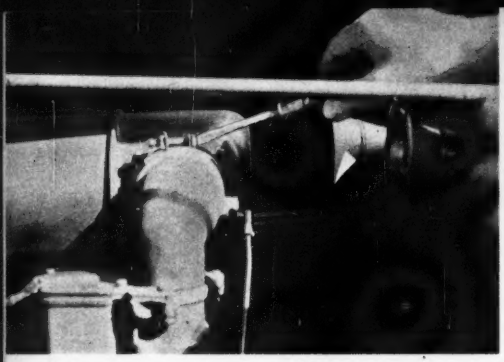
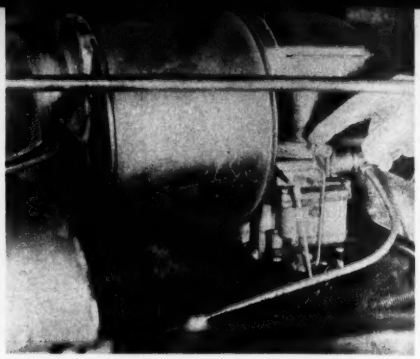
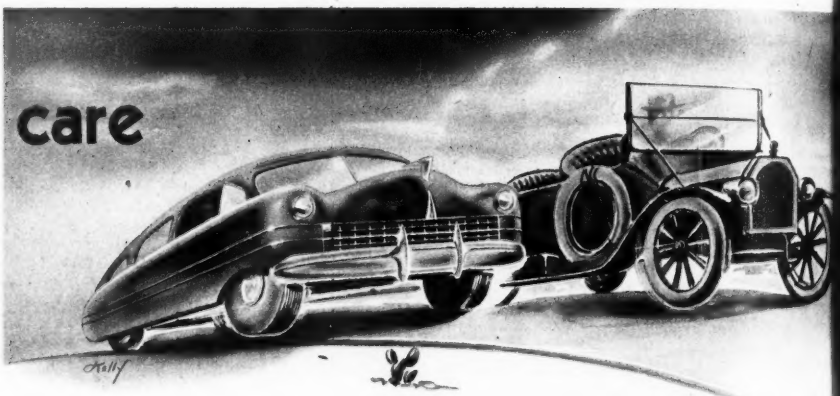


THE AIR CLEANER should not be tightened too much. Carburetor intake is made of a soft metal and if you warp it, you'll cramp the choke valve.



POOR GAS MILEAGE is very often due to a sticky choke valve. The choke valve should always be fully open when the engine has been warmed up.

car care



LACK OF POWER when the engine first starts is due to gasoline not being properly vaporized. The electric spark in this beaker of gasoline will not cause it to burn or explode.

OVERHAULING TIPS

STEEL-FACED cylinder head gaskets require extra tightening of the head bolts. Draw down the nuts about 15 per cent tighter than for other types of gaskets.

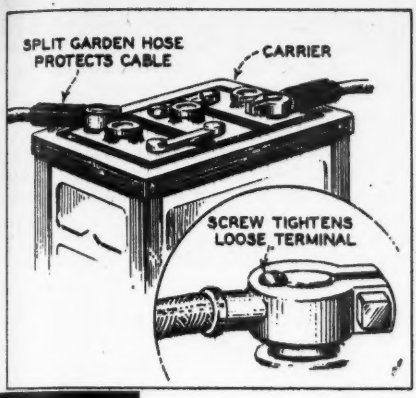
CHECK CORE PLUGS for leaks. They are in the sides of the engine block.

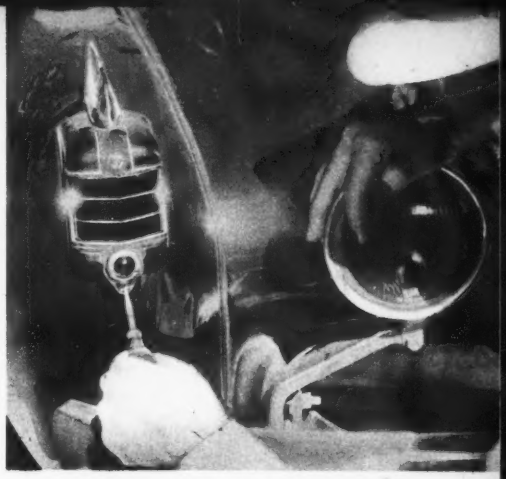
THIS WOULD BE a good time to install a new radiator drain plug. The latest type requires merely a half turn to open.

EVER THINK of checking the radiator overflow pipe to see if it is closed by a dent? This could be serious if the engine is overheated.

HYDRAULIC BRAKE lines should be bled off, flushed with the prepared solution for this purpose, and refilled with a new brake fluid which offers a wider range of immunity from temperature changes.

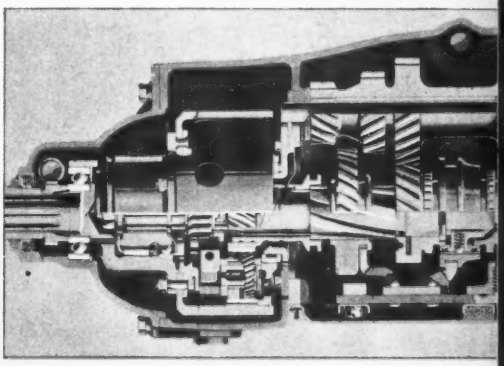
BEARINGS LOOSE? Any well-equipped shop will have an oil pressure tester which forces lube at normal pressure through the lines (oil pan removed). Dripping of oil from the bearings is no sign of trouble, but if the oil comes out in a steady stream the bearings need replacing.





BATTERY KINKS. A split garden hose makes a very effective insulator for worn battery cables. An ordinary wood screw can be used in an emergency to tighten up a loose battery clamp, as shown in the sketch above.

PLASTIC LENSES used in stop and tail lights often turn to a yellowish-white due to action of the sun. Check them occasionally and replace if faded.



OVERDRIVE TRANSMISSIONS need frequent flushings to keep them working efficiently. Drain, refill with engine break-in oil, drive a short distance slowly and refill with recommended lube.

Below: TIRE VALVE LEAKY? Don't be satisfied just to spit on the valve and see if it leaks. Unseat the valve by letting out some air and repeat the test.

BEHIND THE WHEEL

With Fred Russell

If you want a personal reply please include a self-addressed stamped envelope.

I can't seem to get any heat out of my Arvin heater mounted in my 1937 Ford. I am also having trouble with the windshield wipers on my car. When the motor goes it is fine but assoon as the motor warms up they slow down until they are barely crawling across the windshield. R. E. Greene, Wakefield, R. I.

Check the level of the heater. Quite often it is mounted too high so that it is above the top water level of the engine. The wiper trouble is probably due to a leak in the connection at the intake manifold. When the engine heats up the opening becomes larger, contracting again when the engine is cold.

The butterfly valve of the manifold heater of my 1936 Chevrolet is "frozen" in the horizontal position. Will this affect my gas consumption? Hal Kelly, Brooklyn, N. Y.

Your are not going to get a normal warm-up with the manifold heater not working; this will affect your gas mileage if you do a lot of short-run driving.

What causes a knock in my 1942 Oldsmobile? The knock is apparent only when idling and disappears when the second spark plug is shorted. Is it a loose piston pin? James S. Porter, Washington, D. C.

The knock in your engine is probably due to a bent connecting rod rather than a loose piston pin.

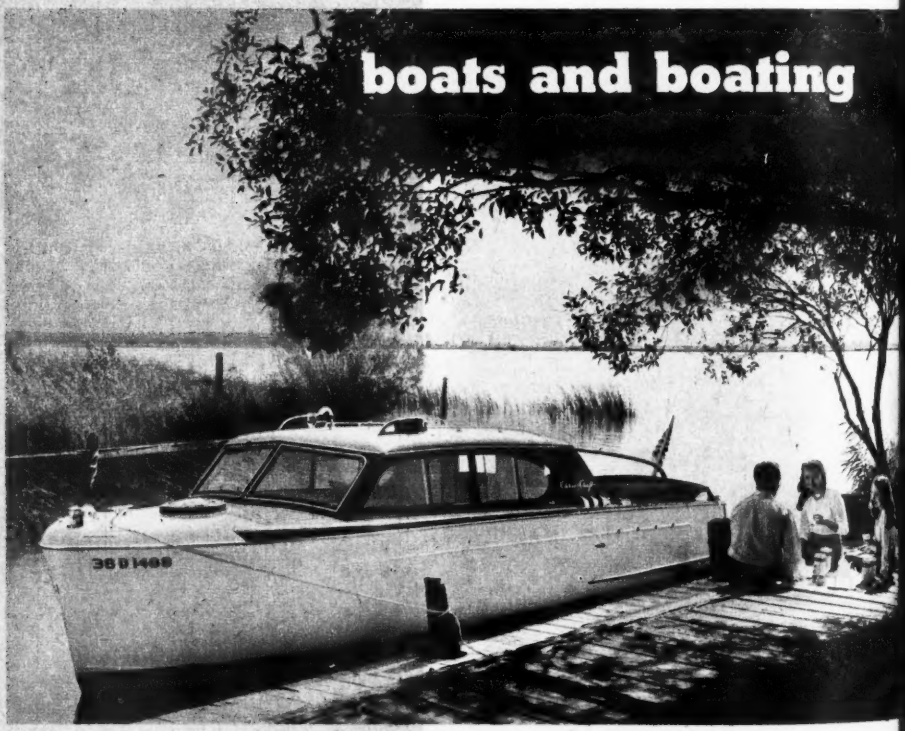
Is your boat really safe? Here's helpful advice that may save your life and prevent damage to your boat when you go cruising.

BY WILLIAM F. CROSBY

FAR too many owners of pleasure craft have the mistaken idea that "safety at sea" is just another legal-sounding phrase on musty government laws that apply only to commercial shipping. Just how mistaken these boatmen are can easily be determined by reading the newspapers after any holiday week-end during the summer months. Headlines that read "Cruiser Capsizes In Lake—Two Drowned" or "Blast Destroys Pleasure Boat—Three Men Seriously Burned"—all tell the sad story of careless handling and lack of safety precautions. If those involved in the accidents had taken the trouble to read the laws, they would have found out that the statutes apply "to *all boats* under 65 ft. propelled by machinery, *including those equipped with outboard motors.*" Obviously, if the same people had complied with the law, they'd never have been in the headlines.

Of all the dangers at sea, and that also includes those mile-long lakes or outboard heavens, the most serious is the handling and storage of gasoline. Many owners regard this highly explosive fluid as though it were ordinary water. You've all seen the gas-dock attendant puffing away on a cigarette while he's filling a tank or a cruiser tied up at the same dock, while the cook is below using the stove to get lunch. Smoking while gassing up should be definitely forbidden, if the guy at the pump insists on doing it, take your business to a safer dock. As for cooking

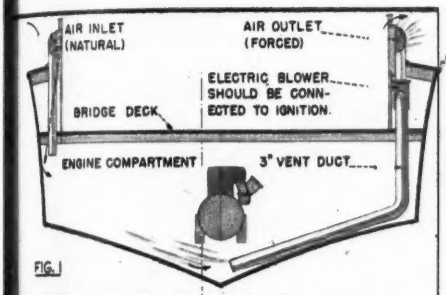
27 Ft. Chris-Craft Cruiser



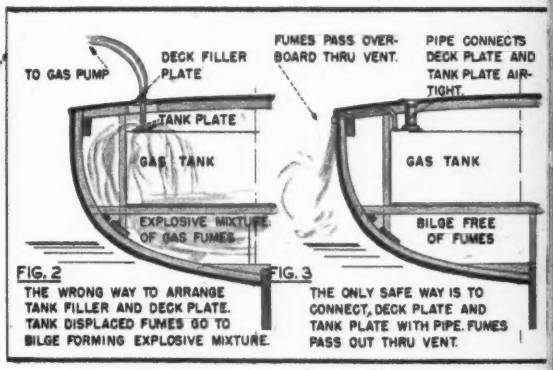
on board when gassing up, make it a hard and fast rule to extinguish all flames of any kind. Gas fumes when ignited, don't give any warning and usually the victims aren't aware of the explosion until they've regained consciousness (if they're lucky). Even with outboards, there should be some kind of pan under the motor brackets to collect overflowing gas and drain it safely overboard.

So much for the "common sense" angle of handling gas. As for the storage of gasoline on board, the Federal laws are very explicit. To quote them, "all boats except those that are 'entirely open,' must have suitable ventilation *to the bilges* of fuel tank and engine compartments." This applies equally to an 18-ft. runabout as well as a 50-ft. cruiser. The reason for this regulation is that gas fumes being heavier than air settle in the bilge of a boat. When you hit the starter button, the motor brushes may spark a bit, and the next thing you know your boat has disappeared in a mass of flames and you're in the local hospital. Natural draft ventilation for engine compartments helps but the safest method is to use a motor-driven blower to make certain all gas fumes are exhausted *before* the motor is started. If you use electric blowers, keep them up high outside the compartment as shown in the drawing so there's no danger of a sparking brush. Incidentally, the same safety rule applies to automatic electric bilge pumps, unless they're airtight as well as being watertight. An ideal forced ventilating system is shown in Figure 1.

The chief cause of gasoline getting down in the bilge in the first place, is faulty construction of the filler plate. Many boats have a deck plate which you take off, exposing the actual tank cap below it. This is illustrated in Figure 2. When you fill the tank, the gas displaces the air in it and since there is no other outlet, it naturally flows between the tank and the deck, winding up in the bilge. Most all boat fires and explosions are caused by this condition. The remedy is clearly illustrated in Figure. 3. Here there's no possible way for the gas fumes to get into the bilge, they're all piped overboard through the vent. A few fumes may bubble up the filler pipe so to be on the safe side, keep windows and hatches nearby closed to prevent the displaced fumes from drifting down inside the boat. One final warning on gas—if your boat doesn't have a pipe between the tank and filler plate—don't put a drop in the tank until one has been installed, along with a vent pipe.



POWER BLOWER SUCKS AIR AND FUMES FROM UNDER ENGINE. A SIMILAR ARRANGEMENT MIGHT BE USED IN TANK COMPARTMENT.



THE WRONG WAY TO ARRANGE TANK FILLER AND DECK PLATE. TANK DISPLACED FUMES GO TO BILGE FORMING EXPLOSIVE MIXTURE.

THE ONLY SAFE WAY IS TO CONNECT, DECK PLATE AND TANK PLATE WITH PIPE. FUMES PASS OUT THRU VENT.

There are other hazards to boating that aren't quite as obvious or spectacular as the gas danger. At the top of the Federal laws is one reading, "All motor boats must carry a life preserver for every person on board." And by that, the government means life preservers in usable condition and readily accessible. If you don't have them on board, you're likely to get some stiff fines when the Coast Guard comes aboard. In addition to regular preservers, every boat should have a life ring or two close to the man at the wheel. At the cry of "man overboard," he can heave it near the person (not at him) before he brings the boat about and picks the luckless member up.

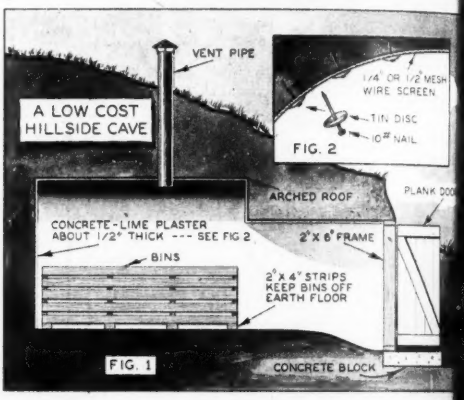
Another government requirement is that you have a backfire trap on the air intake of your motor. Many converted car motors don't have this and if an inspector comes aboard and doesn't find a trap, you'll pay ten times more than the trap costs. So play it safe, and install one.

Left: A large cellar for storing apples. Below: Entrance to a cyclone cellar on a small farm.

Storage and Cyclone Cellars

The good earth can provide shelter for crops and safety for families.

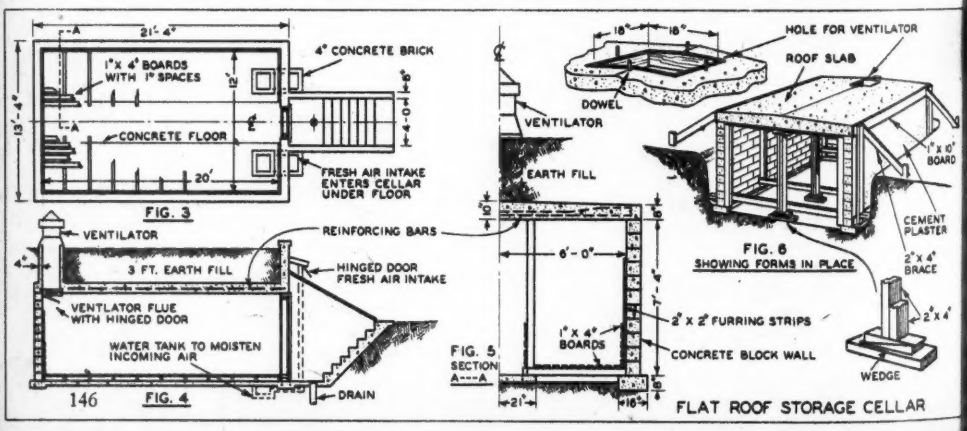
BY DALE VAN HORN

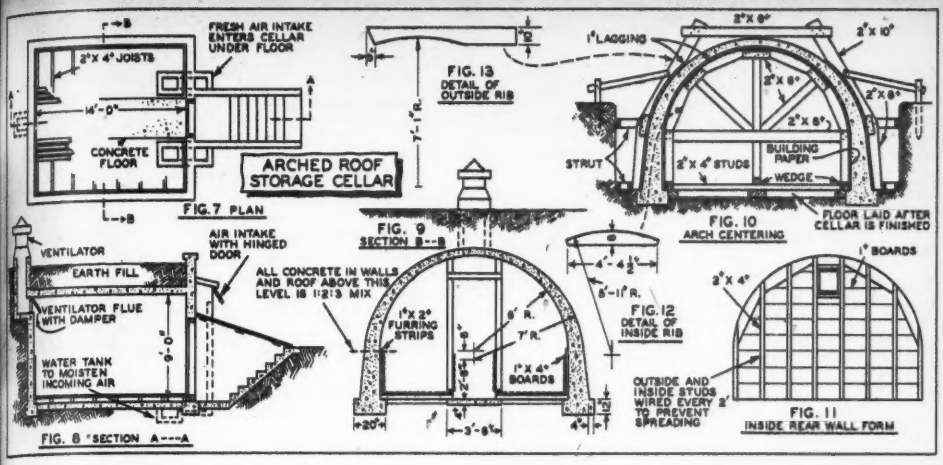


RANGING from mammoth affairs holding 10,000 bushels of root crops to small caves that burrow in the hillside, underground storage spaces serve rural America in a wide variety of ways. Potato growers in the Mid-west use them to house their crops until peak prices are reached, while the owners of small farms line the walls of their cellars with home-canned foods and the produce from their fields. Throughout the cyclone belt, you'll find almost every home and rural school has its cellar for protection against the twisters that strike with little or no warning.

Lowest of all the shelters in cost, is the simple hillside cave detailed in Figure 1. Ideal for slightly hilly ground with a subsoil of compact clay, the cave can easily be completed as a spare-time project. In digging it, be sure to arch the roof for additional strength and hang a planked door at the entrance. By giving the walls and roof an inch coating of concrete mortar (slaked with a little lime), you can add to the permanency of the cave. The concrete may be troweled on directly or laid over wire screening fastened to the walls as shown in Figure 2.

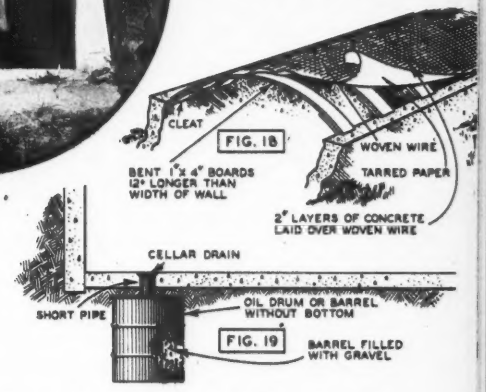
The most ideal cellar for the average-sized farm is the flat-roofed concrete type, the details of which you'll find in Figures 3 to 6. This one has a lot of storage space, with adequate ventilating and humidifying facilities and can be made to be the most permanent building on your place. The cost is quite low if you do most of the work and the upkeep is almost negligible. The walls of the cave are of concrete block





Below: Drive-in entrance to a large commercial storage cellar at Millersburg, Penna.

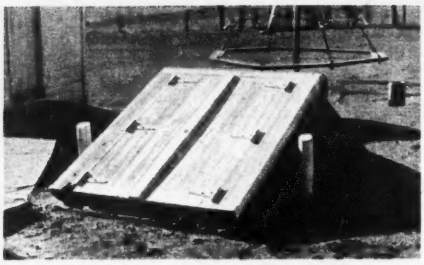
Bottom: Home-canned foods in arch-roof cellar. Center: Simplified version of same construction.

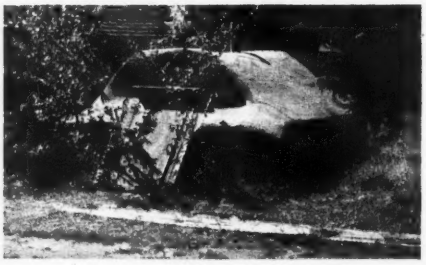


Combination cellar and milk house. Cellar entrance is at the left.

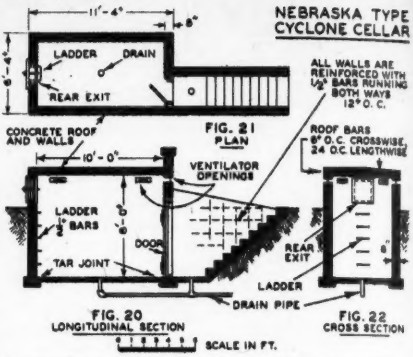
furred with wooden strips to prevent fruit and vegetables from spoiling by contact. Shallow concrete tanks below the wooden flooring keep the humidity at the right level during long, dry spells. The layer of cement on the outside walls helps the appearance and also seals all the mortar joints.

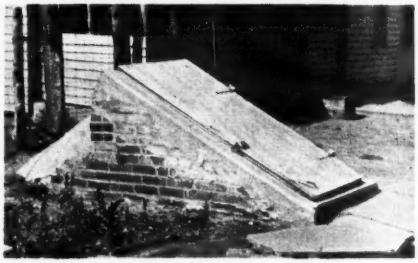
The arched-roof type of cellar illustrated in Figures 7 to 11, is quite similar to that previously described but it is designed for larger farms. Instead of cement blocks, the walls are of poured concrete with a ventilating flue and hinged damper at one end to control the circulation of air. A concrete walk down the center makes it





Top: Cyclone cellar on school-house grounds. Note vent in background. Bottom: Concrete storage cellar half in and half out of the ground.





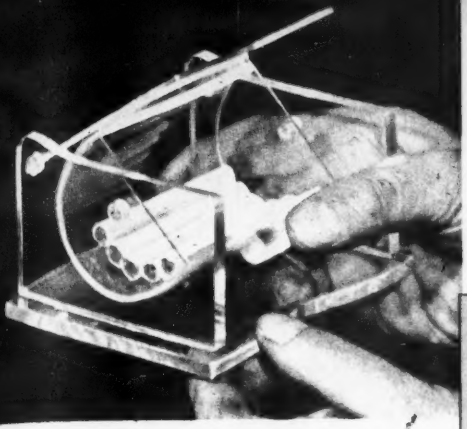
Above: Two level cellar. Entrance to lower level is at rear. Below: Storm cellars should always be located as close to the buildings as possible.

easier to get at the storage bins that line both sides. A simplified version of this form of construction is illustrated in the small inset photo on page 147 and also in Figure 18. Here the curved wooden building forms shown in Figures 10 and 11 have been omitted. Instead, straight-grained boards were bent to shape across the walls, a layer of tarred paper and woven wire added and the arched concrete roof poured and allowed to harden. The boards and roofing paper are removed when the concrete has set.

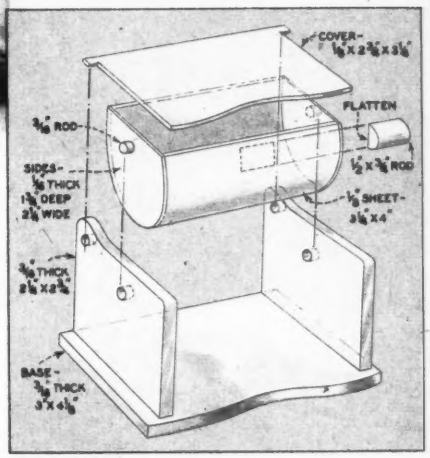
In building any form of underground storage space, adequate provision should be made for the drainage. Under normal conditions, the arrangement in Figure 19 should do the trick but when the cellar is placed in low ground, you may have to use regular drainage tile sloping to a natural outlet.

If you're living in the cyclone or tornado areas of the country, there's no need to tell you of the importance of having a storm cellar available for emergency use. While you can use any of the cellars previously mentioned for this purpose, you'd have to increase the ventilation in them. With a number of people in a confined space for any period of time, this becomes quite a problem. If you already have a good storage cellar and want to build another for emergency use only, the Nebraska type cyclone cellar detailed in Figures 20 to 22 is ideal for this purpose. It's simple to construct and with the rear exit you can get out, should the regular entrance be blocked.

Some farmers prefer to combine their cyclone and storage cellars in one unit. A typical example of this is the two-level cellar shown above and also on page 147. Here the upper level is used for storing produce or as a milk house, while a separate entrance leads to the below-ground room which has adequate ventilation for emergency use during storms.



pop-up CIGARETTE BOX



PRESSING the knob of this plastic box automatically raises the lid and makes twenty regular or king-size cigarettes available. Construction of the box is simplicity itself. The parts are first cut to shape from transparent sheet plastic. The curved piece is then bent to shape by heating it over a circular form. Following this, the holes are drilled for the hinges and all edges sanded and polished. The parts are then assembled with plastic cement.—*E. N. Moore.*

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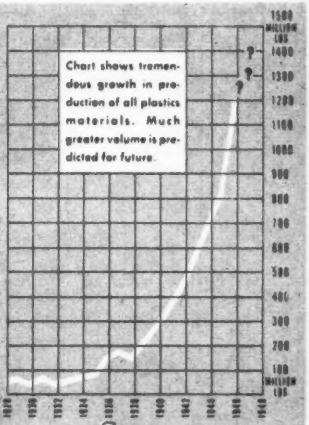

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Upholstered BARREL CHAIR

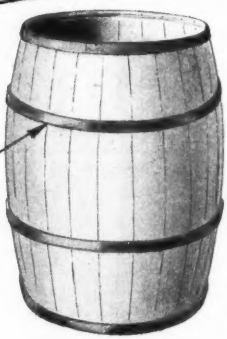
A plain barrel, beer, flour or even herring, made into a smart living room piece.

BY EDA S. JOHNSTONE

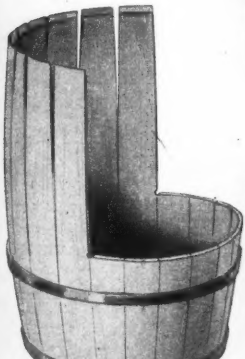
Men will also appreciate the comfort of this well-designed, unusual chair.

SAY "barrel" to most people and they will immediately think of Roll Out The Barrel or of something to walk home in after an unsuccessful night of poker. But, to one enterprising resident of Los Angeles when she appraised a barrel, her mind dwelt upon the practicality of converting one into a comfortable piece of furniture for her living room. And so she did, with the results shown on these pages. These are her instructions:

Get a barrel and remove the two top iron loops. Then cut one-half of the barrel down to a comfortable height, about 17 in. from the floor. The tops of the long staves, which will be the back of the chair, are held together by interweaving them with heavy wire. Cotton quilting is then used to pad both sides of the barrel. This is secured with cotton tape and tacked down.

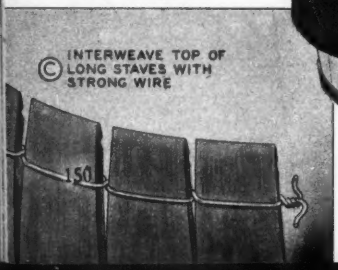


Ⓐ REMOVE THE TWO TOP RINGS WITH A HACK SAW

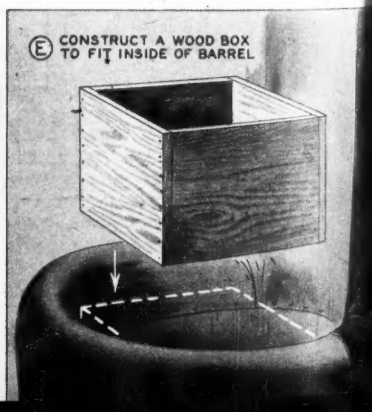


Ⓑ CUT DOWN BARREL WITH A KEY HOLE SAW TO ABOUT 17" FROM THE FLOOR

Ⓓ COVER WITH PADDING AND TWO-TONED COLORED FABRIC



Ⓒ INTERWEAVE TOP OF LONG STAVES WITH STRONG WIRE

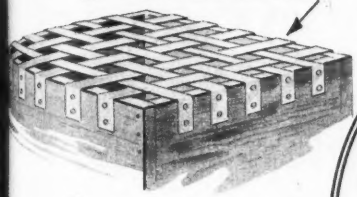


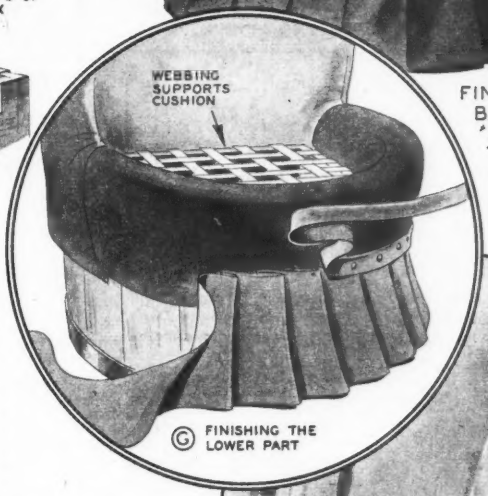
Ⓔ CONSTRUCT A WOOD BOX TO FIT INSIDE OF BARREL

The confining hug of a barrel chair will make it one of the most popular pieces in the room.

FINISHED BARREL CHAIR

Ⓕ INTERWEAVE STRONG STRIPS OF WEBBING AND NAIL TO BOX





Ⓖ FINISHING THE LOWER PART

Both the inside and outside are then measured and the selected covering material cut accordingly. For most barrels, if a two-tone color is desired, a piece of apple green 44x28 in. is sewed end to end to a piece 50x25 in., then fitted over the barrel with the apple green on the inside and a dark green on the outside, the sides are then sewed together after getting a snug fit.

For the lower part of the chair use a darker color. A piece 44x18 in. will do. Another piece, 24 in. wide, is pleated and tacked half way from the seat to the floor and finished with a narrow strip of the dark green material, also tacked in place.

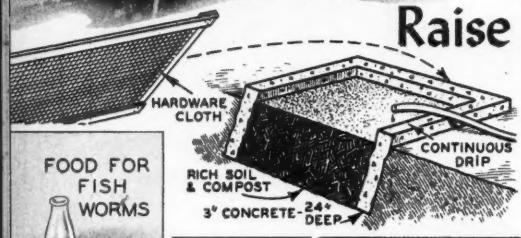
If you prefer, contrasting colors can be used instead of various shades of green.

For the seat, a box is made by nailing together four pieces of wood to fit the bottom. Interweave strong strips of cloth or webbing and nail to the square of wood, and insert in the barrel. A round, well-padded cushion of apple green completes this unusually attractive and comfortable chair •

A: Two-inch mosquito fish, a tasty morsel for bass. B: King-size fishworms are easy to raise in a properly prepared bed. C: When well-fed, crawfish multiply rapidly after shedding shells.

Raise your own live bait

Bait, all kinds and as much as you need, right in your own back yard.



YOU can have a plentiful supply of live bait for bass, pike, pickerel and muskies by preparing a fish worm bed and building a small pool for minnows, crawfish and frogs.

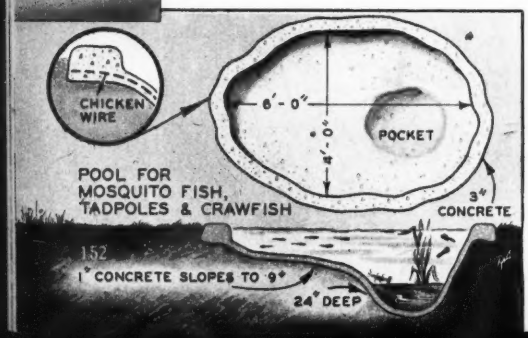
The most important factor in raising big angle worms is in keeping the bed moist. Once it dries out the worms seem to vanish. To retain moisture, in a limited area, a wall of some kind is needed.

Make an excavation 4x6 ft. and 2 ft. deep; fill with rich soil and compost. Some worm farmers recommend stable manure, but this encourages a type of worm which exudes an unpleasant yellow matter when punctured by the hook. Kids refer to them as "stink worms." The true fish worm is clean and plump. Stock can be obtained from a well-cultivated garden. Soak the bed well, then after the surplus water has drained, introduce the worms. Bury them 3 or 4 in. deep. Then every day or so, pour milk bottle-rinsings, oatmeal and cornmeal water on the bed. Add coffee grounds and ground nutshells, covering the latter. A hardware cloth frame will prevent birds from scratching up the bed. Have a continuous drip from the house, or if your kitchen sink drains into the open, run some of this on the bed.

For mosquito fish *(Gasbusia)* and other minnows, as well as crawfish and frogs, a small pool is adequate. Excavate as shown in the sectional view. Soak and tamp the soil and pour an inch of concrete with poultry netting reinforcement. The parapet should be at least 3 in. thick and reinforced. After the first batch is spread in the bottom of the soil pocket and has set a half hour or so, turn [*Continued on page* 158]

Tadpoles, once introduced to pond, will make it home after developing legs. Don't stock with polywogs; these become toads.

Mosquito fish, minnows, crawfish and frogs find a happy home in this 4x6 ft. pool.



This youngster will really stay tucked in for the night with this guard that folds for convenient storage.

Child's Bed Guard

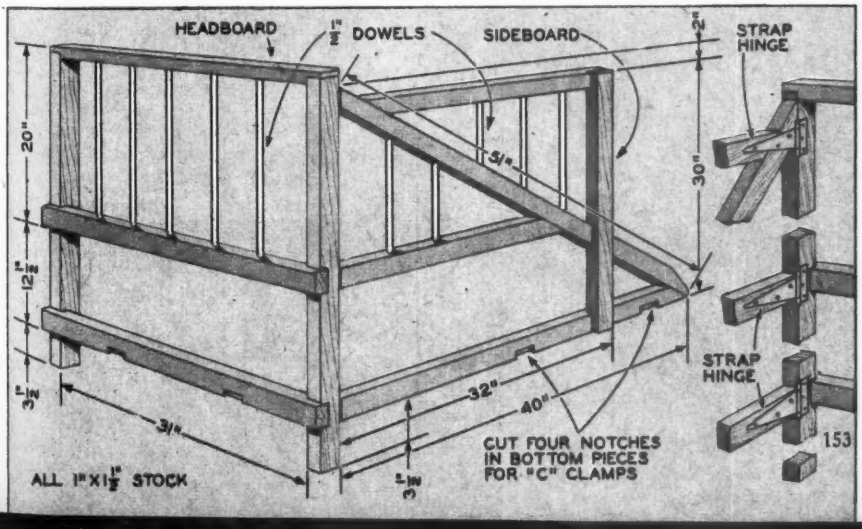
Gives junior a safe and sound trip to Blanket Bay and back.

WITH this simple safeguard, an ordinary day bed can be quickly and easily converted to sleep small children. The conversion can be temporary or permanent because no changes are made in the bed itself.

As you can see from the drawing, the unit consists of two panels, hinged for convenient storage, that are attached to the regular bed stringers by means of small C clamps. For this reason, the lower edges of the bottom pieces should be made the same height as the stringers. With the exception of this detail, the other dimensions can be obtained by following the drawing.

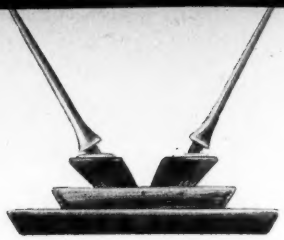
To start the construction, cut the uprights to the correct heights and notch them for the head and side board pieces as well as the bottom stringers. Then assemble the two panels using ½ in. dowels well glued in the frames. The side panel has a diagonal brace for additional strength. Use flathead screws to fasten the panels to the uprights and strap hinges to join the two sections together. The bottom pieces can be notched for the clamps after the guard has been fitted to the bed.

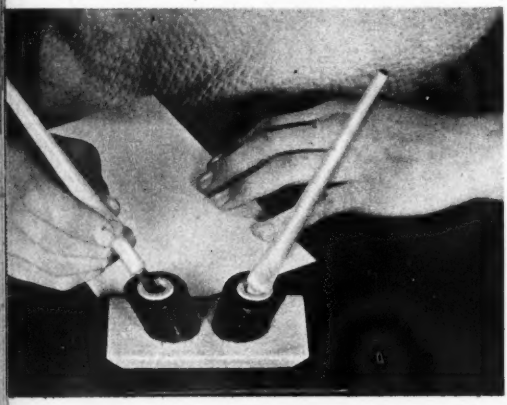
The completed unit may be stained or painted to match other furniture and the decoration of the room.—*E. A. Hine, Jr.*

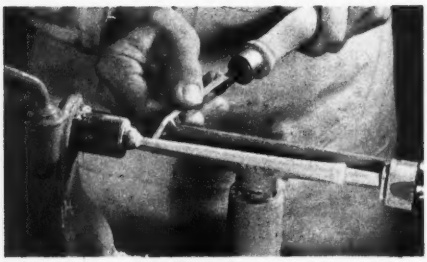


MAPLE PEN SET

A modern treatment of the old inkstand makes an ideal turning project.



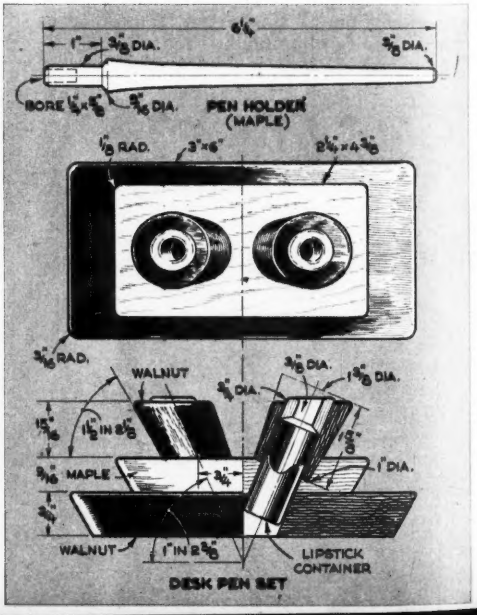




MOST of the material for this distinctive desk accessory can be found among the hardwood pieces in your scrap bin. Begin by cutting the base pieces to the size and shape in the drawing. Sand them thoroughly, round the corners and bore the lower one for screws for temporary assembly. Clamp the pieces together, then scribe through the screw holes to locate pilot holes in the upper piece. Next, make the sockets from one piece of walnut, turning one piece after the other is cut off. The maple bushings are made in the same way but drilled before removal from the lathe.

Next, set up your drill press with an angle of 1 in. in 2⅜ in. and bore the upper base with an expansion bit. Before assembling the bases, fill the grain of the walnut and wipe it. Then glue and screw the pieces together and glue in the sockets. When dry, drill them for the lipstick containers. Block these at the right level and varnish the holes before inserting the bushings. The penholders are then turned from ¾ in. maple squares. Finish the set with lacquer or varnish.—*Milt Evans*

Above: Holders are turned by mounting a block on the screw-center and turning a snug-fitting dowel for the driving unit. Below: Turning sockets. Parting tool cuts are made at both ends to establish diameters.



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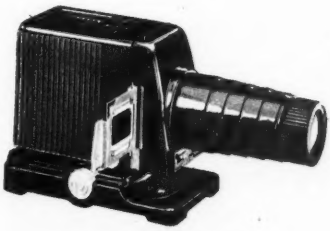
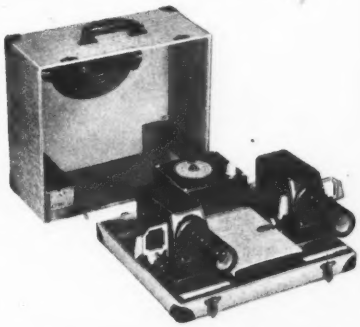
Set up your trim, efficient Kodaslide Projector; load as many as 46 slides in the Kodaslide Changer . . . and you're off to a brilliant showing.

For the slick professional touch, use two Kodaslide Projectors, with the Kodak Dissolve Control Outfit . . . one slide fades out as the next fades in. Consult your Kodak dealer about this equipment . . . EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.



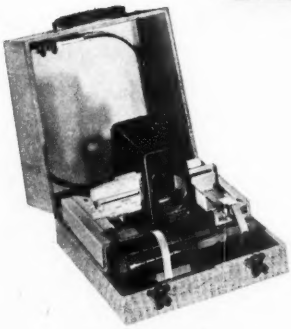
Kodaslide Projector, Model 2A, with 5-inch f/3.5 lens

Shows your Kodachrome transparencies brilliantly. Lenses and entire optical system *Lumenized*—ultrahard coated. Result: approximately 50% more illumination delivered to your screen . . . Accessory 7½-inch f/4 lens also available.



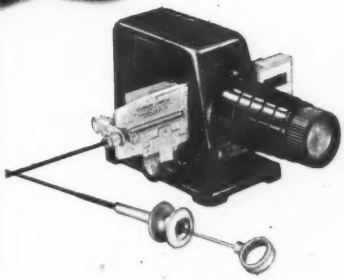
Kodaslide Dissolve Control Outfit

One image appears on screen as other fades out. No awkward pauses, no "break." Outfit consists of case, electrical control unit, two projector platforms, storage space for lens barrels and slide files. (Projectors not supplied with unit.)



Combination Case

Provides space for Kodaslide Projector, Model 2A, spare lamps, the lens, a Kodaslide Changer, and two Kodaslide Sequence Files. Removable cover contains matte screen for trial projections.



Kodaslide Changer (shown here on Model 2A Projector)

Hand-operated plunger (30" cable) automatically changes up to 46 Kodaslides. Fits Kodaslide Projectors, Models 1, 2, 2A.

Kodak

How to Use a Circular Saw

[*Continued from page* 131]

the miter gauge for squareness with the saw blade. Lock the gauge on the "square" position as indicated by the try square. Make a trial cut on a board and check the squareness of the cut. If it is accurate, set the pointer on the miter gauge to 90° on the scale.

Though there are many specialized styles of saw blades available, the average worker will find use for only about three styles. The combination blade can be used exclusively since it will rip, crosscut or miter. The hollow ground blade is desirable when a smooth cut is wanted. Another blade which will prove itself useful, especially if production work involving long cuts with the grain is in progress, is the rip blade. Another accessory is the dado head, made up of two outside cutters and three or four inside cutters. With various combinations grooves, from ⅛ in. to 13/16 in. width, may be cut.

Ripping, cutting stock to required width, is one of the most common operations. Set the fence for the required width of cut. Place the work against the fence and feed into the saw. Jerky, uneven feeding and forcing the work should be avoided.

A good operating stance is shown on page 130. The operator should stand a little to the right side and hook the little finger over the top of the fence. This position will keep the operator's face free of sawdust thrown up by the saw. In the event that wood should be thrown back by the blade, the operator will be standing in the clear. Hooking the finger over the fence will serve as an anchor for the feed hand, to keep it from being drawn into the blade, should anything go wrong.

Several important "don'ts" are in order when using a machine that travels as fast as a circular saw. An 8 in. saw traveling at 3,400 r.p.m. or a 10 in. saw traveling at 3,100 r.p.m. *means danger to a careless operator.* Always stop the machine to make any adjustments or remove slivers of wood. Save conversation for a more opportune time. Do not rip work which has not a fairly straight edge against the fence.

Do not set the blade too low or too high for the work at hand. A good height is to have the blade set so that several full teeth are exposed at the top of the blade swing. A high set blade cuts fast and free, but will throw the work the instant there is any twisting, while a blade that barely projects through the work will become clogged with sawdust.

The moulding fence is an important part of the saw especially when ripping straight pieces. However, when ripping short thin pieces of wood, they are apt to slip under the opening of the fence at the end of the cut. To avoid this, face the fence with a strip of wood and use a push stick to feed the work into the blade. Regardless of the work being ripped, a push stick should be used if the work is less than 3 in. wide, since that amount of clearance is not sufficient for safety when feeding the work with the hand.

In addition to the actual sawing operations, the saw and dado head are used in making a wide variety of joints, several of which are explained in the following paragraphs.

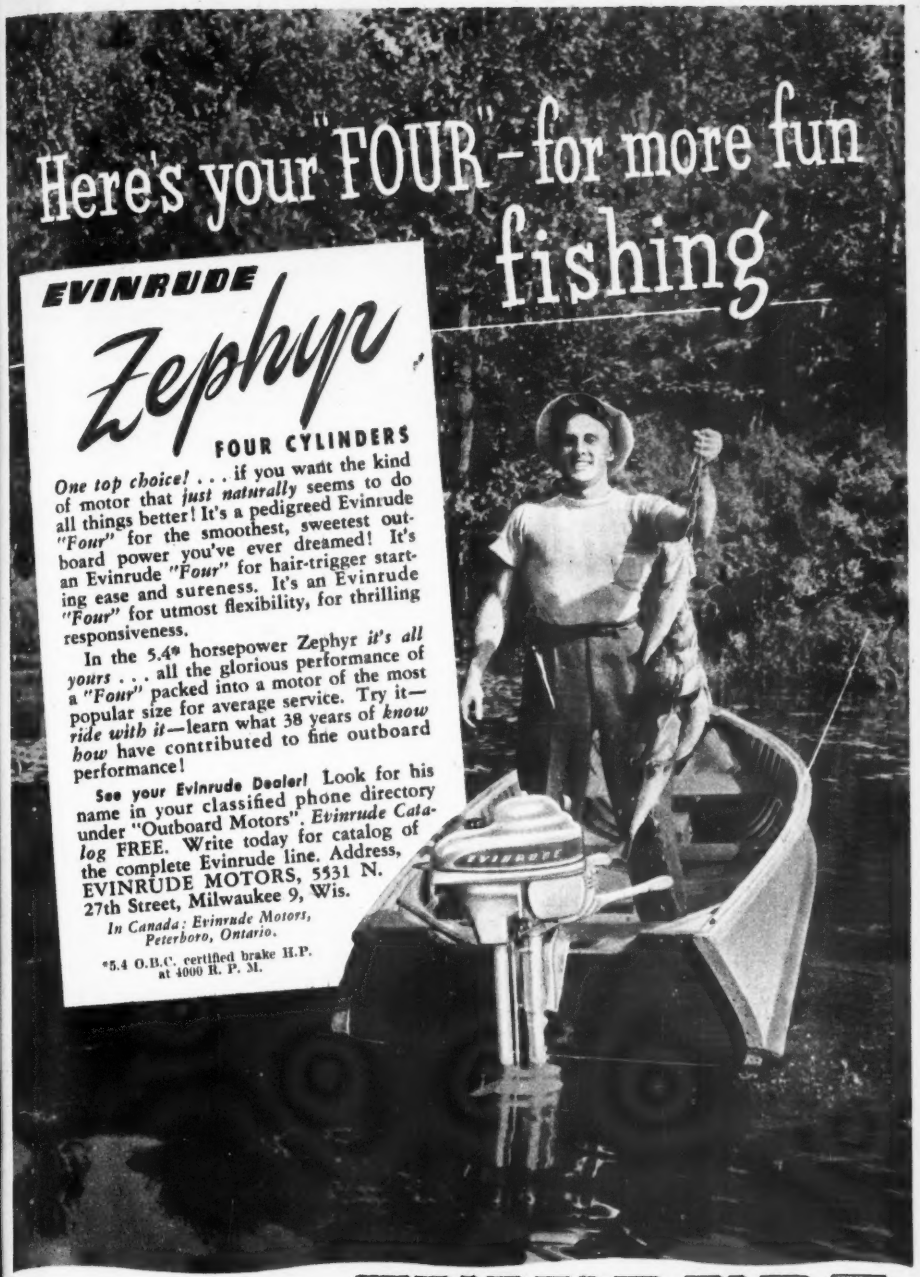
Miter corners are widely used in making frames and boxes where the corner joints are not to lap. In cutting miters, set the miter gauge at the required angle. The gauge may be used in either table groove and it may be set on either side of the center position Unless tightly held, miter cuts tend to creep slightly into the saw blade. When accuracy of the cut is desired, the miter gauge clamp attachment not only assures precision cutting but greatly simplifies the work.

A common joint used for drawer construction is the rabbet joint. In this joint, all of the work is done on the front section of the drawer, the sides being left full thickness. When ¾ in. front stock is used, ¼ in. for the lip is sufficient. To cut the rabbet in the front of the drawer, mount the ¼ in. dado combination on the saw. Set the depth of cut for ½ in. Place the front stock tight against the side of the dado head, as shown in the photo. Then use the side stock, as shown in the same photo to determine the position of the stop block. Clamp the stock in place and make the first cut. Clean out the surplus stock by moving the work over. Use the same dado combination to cut the rear corner joint and groove the sides and front to take the bottom.

Cutting a tenon, using the dado head, is a simple job with a power saw. Usually, the widest dado combination is used, this being wide enough to cut a stub tenon for all practical purposes with but one pass over the dado. In case a longer tenon is needed, the inside cut should first be made and the surplus then cleaned out as in making a box joint.

A blind dado is a cut that is not a through groove but stops short of one or both ends. It is commonly used on the making of a splined joint. Clamp an auxiliary fence of a wood strip, to the regular fence. Clamp stop blocks, to control the beginning and end of the cut, to the fence.

The most important thing to remember is this—*always be careful*—you cannot grow new fingers. If your saw is located where children or well-meaning but ignorant friends can get at it when you are not around, it is a good idea to put an extra switch in the power line. The switch should be located in some inconspicuous place so that it is not apparent to accident-prone people. •



FIRST IN OUTBOARDS — 38TH YEAR

EVINRUDE

Barnacle

[*Continued from page* 127]

When they are finished, mount the side locks in the locations shown, and install them with the sections butted together to make sure they match. The bottom locks are mounted 12 inches out from the centerline and the holes for the carriage bolts drilled with the sections lined up. After cutting notches for the side locks, fasten the moldings to the clamps with marine glue and 1 in. No. 8 screws on 8 in. centers. The keelsons or rub strips on the bottom of each section go in place next, again using glue and ¾ in. No. 8 screws to fasten them down, after cutting notches for the locks. One strip is fastened at the centerline while the other two go over the locks. The oar locks are then fitted in place on the center section. To finish the boat, paint or varnish the inside of the sections, including the removable seats. One accessory that will lengthen the boat's life is a canvas cover to fit over the nested sections while in transit and keep out the moisture. The metal transom extensions in the upper drawing on page 127 will increase the speed of the boat when an outboard is used. ●

BILL OF MATERIALS

(Approximate Quantities Required)

Plywood

Bottom, sides, bulkheads	2 Pcs. ¼" x 4' x 8'
Transom, seats, motor board	1 Pc. ⅝" x 4' x 6'
Gussets	From ¼" scrap

Seasoned White Oak, Spruce or Fir

Stem	1 Pc. 1¾" x 7¾" x 2'
Chines and clamps	4 Pcs. ¾" x 1½" x 12'
Bulkhead, transom and seat frames	50 Lin. Ft. ¾" x 2"
Keelsons or rub strips	3 Pcs. ½" x 1½" x 12'
Moldings	2 Pcs. ½" x 1" H. Rd. x 12'

Common Lumber

Building Form	2 Pcs. 2" x 4" x 12'
	2 Pcs. 2" x 4" x 2½'
	2 Pcs. 2" x 2" x 4'
	4 Pcs. 1" x 4" x 3'-6"

Fastenings

4 Dozen ¾" No. 8 F.H. Wood Screws; 4 Gross 1" No. 8 F.H. Wood Screws; 2 Dozen 1¾" No. 8 F.H. Wood Screws; 1 Dozen 2" No. 12 F.H. Wood Screws; 1" Galv. Iron Shingle Nails; Copper Tacks; 8-¼" x 1" Carriage Bolts; 8-¼" x 1¼" Carriage Bolts; 8-¼" Nuts; Lock Material—1 Pc. ⅛" x 1" x 4' Brass, 1 Pc. ⅛" x 1½" x 2' Brass; 10 yds. 6-8 oz. Canvas, 36" wide; 1½ Gallons Canvas Cement; 1 lb. Marine Glue; Yacht Trowel Cement; Seam Filler; Paint, Enamel and Varnish; Pair Side Plate Oarlocks. 1 Pair 5½' Oars.

BARNACLE BLUEPRINTS

Complete, large-scale working blueprints will make the construction of this 11-ft. sectional boat easier and quicker. Order Plans No. B-146 at $1.00, from the M I Reader Plan Service, Greenwich, Conn. Enclose check or money order with your letter and if outside this country, include an International Postal Order, payable in U. S. funds.

Raise Your Own Live Bait

[*Continued from page* 152]

in a very small stream from the hose and leave running, filling the pool as you plaster the sides. Concrete will cure better under water. When this has been drained and has set hard enough to step on, go over the entire surface with a mixture of plastic cement and water in a gravy-like consistency to fill all the pores of the original layer. This renders it watertight. Fill with water for a day or two, then drain by siphoning. Refill with fresh water after you have put water plants in the soil pocket. Then stock with minnows, crawfish and tadpoles. The latter will feed on algae, the crawfish on bread and meat scraps as well as worms, and the mosquito fish on insects and mosquito larvae.

MI Contact Printer

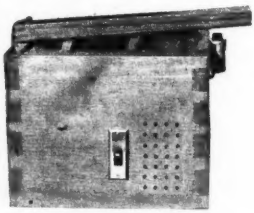
[*Continued from page* 115]

to the forward end of the handle by means of a light cord which passes through two eyelets on opposite ends of the forward part.

You will need a piece of plain glass and a piece of flashed opal glass (sometimes known as white osram glass) to fit inside the printing frame. The contact switch is mounted on the front end of the printer by means of a steel clamp. Drill a hole directly below this switch for the necessary wires.

Follow the wiring diagram carefully. When the cord is plugged in and the line switch is thrown to "on," the pilot lamp will light. Then when the negative is placed in contact with the printing paper and the handle pulled down, the two 60-watt lamps will flash on. They will stay lit as long as there is pressure on the contact switch. An exposure for an average negative will be in the neighborhood of four seconds. The holes in the side of the box are covered from the inside with red cellophane to act as a safelight.

Finish the entire box with two coats of clear shellac. Then rub down with steel wool and Simoniz Kleener.



Full-size plans of the MI Contact Printer are available. Send remittance of fifty cents and request to the MI Reader Plan Service, Fawcett Publications, Inc., Greenwich, Conn. Ask for Blueprint No. P-1.

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CRUISE-MATE, 19-ft. of cruising comfort. Sleeps two, has large protected cockpit, outboard power. No. B-144, $3.00.

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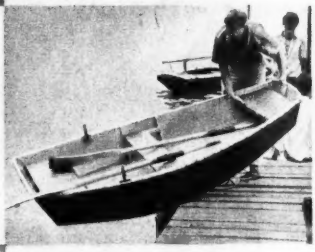
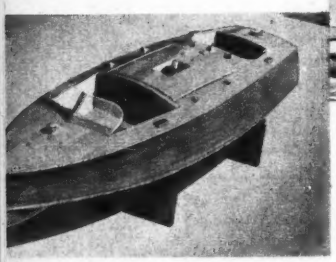


BOUNCIE, 32-in. model speedboat for .19 to .60 gas engines. Spectacular performer for beginner or expert. Plans include FULL SIZE frames and complete instructions. No. 362, 50c.

1946 SOAP BOX DERBY race car winner by champ Gilbert Klecan. Plans contain layout of all parts, step-by-step diagrams, perspective views and complete with instructions. No. HJ-11, 50c.



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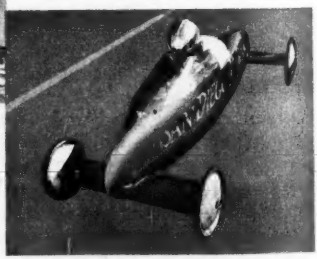

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MARLIN 36 SPORTING CARBINE
Barrel Length 20"

MARLIN 36-A RIFLE
Barrel Length 24"

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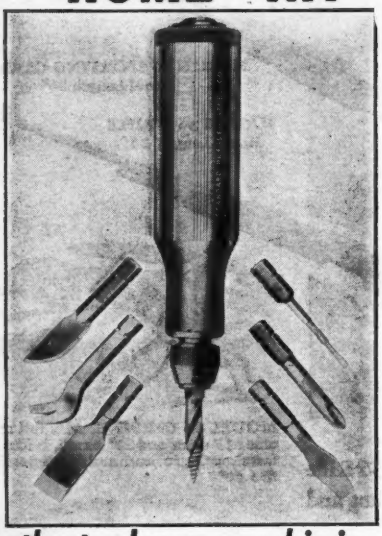

the tool you need is in the hollow handle

A boon to the harried tool hunter is this new Home Kit which contains seven interchangeable tool bits made of finest alloy steel. Bright red hollow plastic handle holds a gimlet, instrument and 1/4" screwdriver, a Phillips bit, tack lifter, knife blade and a 3/16" chisel. Kit is compact — only 4 1/4" long.

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One-Step Camera

[*Continued from page* 58]

hand-coated receiving paper stock did not show this streakiness or other objectionable flaws.

One-step prints have a resolving power of between 10 and 30 lines/mm. compared to 50 lines for Plus X film developed in D-76.

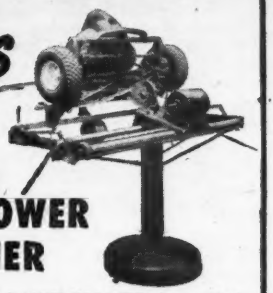
Since the Land one-step system is, in effect, a reversal process, its exposure latitude is pretty narrow—within one stop of "normal." You can't compensate for large exposure variations by changing your printing technique as you do in ordinary, negative-to-positive photography. Amateurs will be obliged to use a meter or reliable exposure guide for one-step photography, although a poor exposure will be no calamity since a second, corrected exposure can be made by the photographer before leaving the scene. In the case of the materials demonstrated, the one-step process increased the effective film speed of the Verichrome emulsion used by about four times the rated speed.

It remains to be seen whether materials for one-step photography can be made in sufficient quantity and at low enough cost to hold the continuing interest of the average man-in-the-street. Materials will have to have good keeping qualities (shelf-life) and be capable of producing reproducible results from one production batch to another. Moreover, claims for one-step image permanence will have to stand up in actual practice. (Polaroid technicians insist that the image has successfully withstood accelerated aging and fading tests and that some of the excellent one-step pictures exhibited to the photographic press were several years old.)

In the realm of serious photography, newspaper cameramen and medical and industrial X-ray technicians will undoubtedly be quick to adapt one-step photography to their needs. Specialists in photographic engineering should be quick to follow. On the other hand, it seems likely that illustrators and pictorialists may never adopt one-step photography except for the possible purpose of "pulling" quick proofs before making "production" exposures.

When one-step photography comes into its own, it's almost certain that the drug-store photo finisher will give way to a more specialized, quality service for contact printing and enlarging conventional negatives, as well as for printing reusable film negatives made by the one-step system. Furthermore, it seems inevitable that films exposed in ordinary cameras such as we have today will be processed "on the spot," in the camera store or at home, in a finishing machine based upon the one-step principle (Figure 4)—unless special effects or extremely high detail resolution are called for.

MORE PROFITS with MODERN LAWN MOWER SHARPENER



SHARPEN ANY LAWN MOWER from 5-inch Edger to 36-inch Power Mower in ten to twenty minutes with a MODERN LAWN MOWER SHARPENER because dismantling is unnecessary — neither handle, roller, wheels nor motor need be removed when sharpening any mower. . . . the MODERN SHARPENER eliminates all hand filing; it precision grinds to the extreme ends of both left or right reel blades. Bottom knife is held in same brackets for sharpening. NO EXTRA ATTACHMENTS! Order today! Price $241.50 (less motor) f.o.b. Pasadena. (½ or ¼ H.P. single phase motor recommended.)

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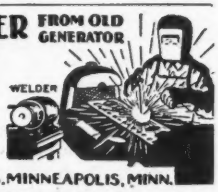

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Ready for Delivery! SYNCRO . . . new, remarkable, patented, magnetic jig saw . . . needs no belts . . . no motor . . . no gears . . . no oiling! Just plug into any 60 cycle A.C. 110-130 volt outlet—and saw! Portable . . . world's safest saw! Cuts clean, smooth . . . no sanding necessary! Ideal for hobbyists, craftsmen, light production. Perfect for models, displays, inlays, etc. Cuts intricate designs on ¾" soft wood, ½" plywood and thinner hardwoods, metals, plastics . . . NOT for ordinary lumber. Leaves NO ragged undersides on plywood or heavy cardboard. Special magnetic safety stroke features! Nothing else like it! Sold on 10 days Moneyback Trial! Prompt delivery guaranteed. Rush name, address on postcard for FREE details, Trial Offer. Hurry!

SYNCRO SAW CORP. Dept. F-67 Rochester, Mich.

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When you own a

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Visit your country's historic places, natural wonders and famous fun spots the Harley-Davidson way! Go anytime — stop where and when you please — no timetables to follow. Your Harley-Davidson turns every evening, holiday and weekend into *extra vacation time* — as you join other riders on pleasure trips. Take in gypsy tours, race meets, hillclimbs and other thrill-packed motorcycling events. See your Harley-Davidson dealer NOW — and mail coupon today!

HARLEY-DAVIDSON *Motorcycles*

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Please send at once free copy of 24-page "ENTHUSIAST" Magazine, filled with thrilling motorcycle action pictures and stories.

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Address.....

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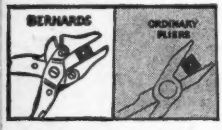
There's no other pair of pliers in the world like the Parallel-Action BERNARD. And here's why they're so handy for *you*.



Jaws close parallel—like a vise. Fit snug and flat. Won't slip or mar the nut.

Powerful cutters on the *outside* of the head, easy and convenient to use. They'll cut an 8-penny nail

Hundreds of thousands of BERNARD's went to war in Yank machine gun kits, but, once again, they're available to you at your local hardware store.

Look for the name "BERNARD"

BERNARD Parallel-Action PLIERS are one item in a line of fine hand tools—hedge clippers, pruners, paper and leather punches, etc.—known for quality for 75 years. *Free catalog on request.*

QUALITY TOOLS SINCE 1870

BERNARD

TRADE MARK REGISTERED

WM. SCHOLLHORN CO.

7206 Chapel Street, New Haven 9, Conn.

Electric Cannon

[*Continued from page* 72]

There is, theoretically at least, no limit to the electric tension that can be produced. Because of their higher puzzle velocity; electrically fired shells could be shot over a much longer range, or, in the case of an A.A. gun, to a much higher altitude.

The disadvantages look about as bad as the advantages look good. One of the most formidable is the enormous amount of electric current consumed. A long range gun firing 300-lb. shells over a range of 125 miles at the rate of one shell per second would just about account for the output of Boulder Dam, provided there are no large losses anywhere in the system.

Nor can it be said that the gun itself is simpler than an ordinary gun. It consists of quite a number of separate coils. The coils cannot be wire, but must be hollow tubing so that they can be cooled by circulating water. That makes for a lot of plumbing connections, a motor driven pump and either a water cooling unit of high capacity or a large supply of cold water. The switching system, even if simplified, could still not be called simple. And everything is, of course, subjected to the customary troubles connected with the handling of powerful currents.

In spite of all these difficulties the Germans as well as the Japanese went ahead trying to design electric guns. After having given up the idea of an electric long range gun, the Germans decided on an anti-aircraft gun, six barrels linked to one power unit and fired in rotation. Each barrel was to be 10 meters (about 33 feet) long and the muzzle velocity of the projectiles was to be 2,000 meters (about 6,550 ft.) per second. Apparently they did not have very definite ideas about the projectiles, but it had been determined that they should be able to carry a high-explosive charge of 1 pound and 2 ounces.

Naturally the Germans calculated the current consumption of their planned gun. They assumed that each barrel could fire a shell every five seconds, or 12 rounds per minute, so that a six barrel unit would fire 72 rounds per minute. This required less current than the largest type of stationary Diesel engine could produce driving suitable generators. They felt on the safe side as far as current consumption was concerned. But when the Allied armies captured their laboratories they were still very busily testing ideas, none of which proved practical.

The unsuccessful performance of the Germans, and the mildly silly performance of the Japanese in the field of electric artillery, does not mean that the idea is not good. It merely means that there are great practical difficulties to be overcome and that nobody so far had the time and money to overcome them. •

New Sensational RADIO

Developed by Army Radar Branch

At last, the sensational postwar midget radio, known as RADARADIO. Small, superbly superior in quantity. Recent radar developments make this set unique. Enjoy your favorite radio broadcasts without disturbing others. Smart streamlined design. Cabinet made of durable, colorful plastic. Comes complete with earphone for individual reception.

SEND NO MONEY—LIMITED SUPPLY

Order today. Limited number available at special low price of only $7.98, postpaid, complete with earphone. SEND NO MONEY. Upon delivery pay postman only $7.98 plus postage, C.O.D. charges. Or send $7.98 with order for postpaid delivery. Return in 10 days (untampered) for refund if not delighted. RUSH order NOW!

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Conventional slide rule dial. USES NO electricity, battery, tubes. Perfect lifetime pleasure. GUARANTEED reception when used as directed. Nothing to assemble—comes ready to use! Order now!

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Guaranteed by Good Housekeeping or defective or not as advertised thereon — Merchant's or a refund of money

Kills the fleas *Quickly!* Keeps others off *for Days.*

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Either Kind 25¢ & 50¢

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Keep your drills in this handy all steel index case. No. 13 holds drills from 1/16" to ¼" by 64s. Send $1. by check or M. O. (or see Dealer). Write—

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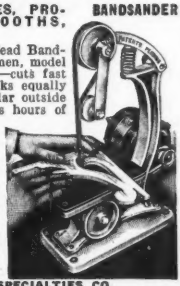
NEW TOOL READY!

QUICKLY SHAPES, SANDS, CARVES, PROFILES, GRINDS, BEVELS, SMOOTHS, POLISHES, CLEANS!

BANDSANDER



Industry's most versatile machine—The Mead Bandsander—now available to hobbyists, craftsmen, model makers, pattern makers, home workshops—cuts fast and clean on wood, metal, plastics! Works equally well on inside cut-out openings or irregular outside edges, on intricate scrolls, curves. Saves hours of tiresome hard work—does better job. Nothing else like it. IDEAL TO GIVE OR GET FOR WORKSHOP! Sold on 5 Days' Trial, money back GUARANTEE.

FREE!
Write for free, lavishly illustrated Circular describing how Bandsander—the machine that amazed the experts—saves time, money, trouble. Write now—a post card will do!

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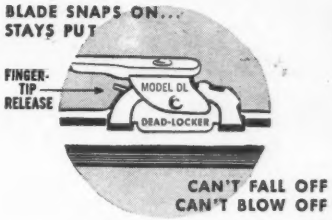
"Dead-Locker"

WINDSHIELD WIPER ARMS and BLADES



(A war-born invention—by ANCO—first for military aircraft—now for your car.)

DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car... in stormy weather... with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them—Newest Models! But he forgets to remind you? Too busy? You can't shoot him for that!

PATENTS MAKE JOBS

After all, it's *your* car to protect. So *you* remind *him*. Get RAIN-MASTERS ...patented features...original equipment on many makes of high grade cars and trucks . . . used in war—on our fighting tanks and trucks and ships and bombers too...because ANCO RAIN-MASTERS clean quicker, clean cleaner... last longer. May save you a costly smashup.

Ask for RAIN-MASTER Windshield Wiper Arms and Blades next time you buy gas.

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA

Start a
SAW REPAIR
BUSINESS!

MAKE A GOOD LIVING IN YOUR OWN BUSINESS—sharpening saws with the Foley Automatic Saw Filer. It makes old saws cut like new again. All hand saws, also band saws and cross-cut circular saws can be filed on this ONE machine.

THERE ARE HUNDREDS OF SAWS TO BE FILED in your own neighborhood, used by farmers, carpenters, homes, schools, factories, etc. W. L. Tarrant writes: "I left my old job last September and in 10 months have filed 2,159 saws. We have a lovely business worked up and cannot keep up with the work."

SEND FOR FREE PLAN. Shows how to start this steady cash business. No experience needed, no eyestrain, no canvassing. Send coupon today.

FOLEY *Automatic* SAW FILER

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Send Free Plan on Saw Filing business, no obligation

*Name*_____

*Address*_____

Electrons . . . for a Microscope

[*Continued from page* 77]

and sharply-defined as any light microscope could have shown them, but 20 times as large. "Want to see 'em grow?" he asked. "Twist this knob."

The bacteria spread out in every dimension. Instead of the tiny eye-cracking dots under the highest magnification of the light microscope, they seemed as big as tennis balls. Instead of tiny, fragile, wispy filaments, I saw willowy, curving, symmetrical rods, with an internal structure of their own, and long, fluttering flagella. (There is a technique of showing flagella under the light microscope, but it is tremendously difficult and seldom used.)

The bacteria were not moving because the vacuum and electron bombardment had killed them. Mr. Merrill said, "Scientists are working on an air-tight cell in which bacteria will stay alive, however, and we hope it will overcome this difficulty. But that would have its problems, too. Even the tiniest quiver would be magnified so that the bacteria would seem to move an inch. In fact, even Brownian movement, which is caused by molecules bumping into each other, would seem like a hootchie-cootchie dance at 30,000 diameters."

The electron microscope is perhaps science's Number One tool for probing the secrets of the universe. And its value is really only just beginning. •

New Ears for the Deaf

[*Continued from page* 82]

then "custom tailored" to make it level off this curve. Frequently, one of a number of receivers can be used. One manufacturer refers to his various receivers as "hearing lenses," likening them to eyeglass lenses. Most present-day aids also have an adjustment whereby the patient himself can alter the tone or pitch for different purposes. He can find the best adjustment for hearing ordinary conversation, for speeches, for music.

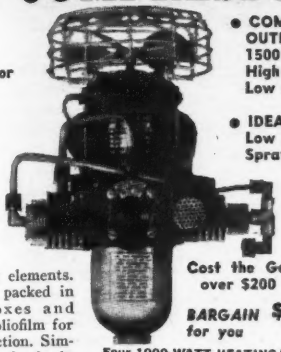
Individually-molded ear-pieces are another modern advancement. A plaster cast is made of the outer ear canal and the plug then molded of rubber or plastic, like the inlay for a tooth. Such careful fitting is desirable because it helps to prevent interfering noise caused by a poorly-fitting ear-piece that moves in the canal.

The small size of modern hearing aids has been brought about largely by human vanity. The manufacturers, thoroughly conscious of this, have therefore concentrated on making their instruments ever smaller and less conspicuous. This also accounts for the flesh-colored instruments and ear-pieces now in

[*Continued on page* 170]

LIMITED STOCK! NEW, 27-VOLT AC-DC

AIR COMPRESSORS



- 1/3-HP Motor 3-stage Compressor
- 4500 RPM
- Weighs 28 lbs. Boxed
- COMPRESSOR OUTPUT is 1500 Lbs. High Pressure Low Volume
- IDEAL for Low Pressure Spray Gun

Precision built. Convert with four 1000-watt heating elements. Individually packed in wooden boxes and wrapped in pliofilm for double protection. Simple directions for hook-up included. Rush us your order, today.

Cost the Government over $200 to build!

BARGAIN for you $15 FOB

Four 1000-WATT HEATING ELEMENTS, only ----------$3.95

The above is only one method for hooking up this compressor, additional hook-up shown on the instruction sheet.

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STEELS and ALUMINUMS with a motorboat tone

SINGLES, Chev, V-8, Plymouth, Steels $5.50, Aluminum $6.50. Chry., Olds., Buicks, etc., Steels $7.50, Aluminum $8.50. V-8 and MERCURY DUALS, Steel $17.50, Aluminum $20.00. Aluminums are guaranteed for life of your car.

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Harold Hunt wants to send you big new No. 16 Catalog. Over 148 pages of woodworking ideas, 12 pages of rare woods in natural colors. UNEQUALED BARGAINS in imported and American woods, supplies, hard-to-find hardware. Send only 15c to cover postage and handling.

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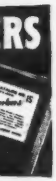
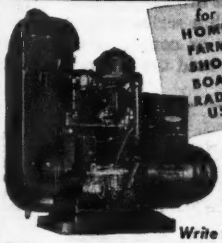
only 15¢



ELECTRICITY *Anywhere*



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Bud Eddy, well-known sportsman says, "This flat bottom Maine-Built Boat draws very little water, yet is steady as a rock in open water — light and easy to handle even when loaded. It's the best for all-around use I've seen".

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NEW Invention

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If you have a workshop—at home or in business—you need this new Warner Electroplater. At the stroke of an electrified brush, you can electroplate models and projects—you can replate worn articles, faucets, tools, fixtures, silverware, etc. with a durable, sparkling coat of metal . . . Gold, Silver, Chromium, Nickel, Copper or Cadmium. Method is easy, simple, quick. Everything furnished—equipment complete, ready for use. *By doing a bit of work for others, your machine can pay for itself within a week.* So make your shop complete by getting a Warner Electroplater right away. Send today for FREE SAMPLE and illustrated literature. ACT AT ONCE! *Mail Coupon.*

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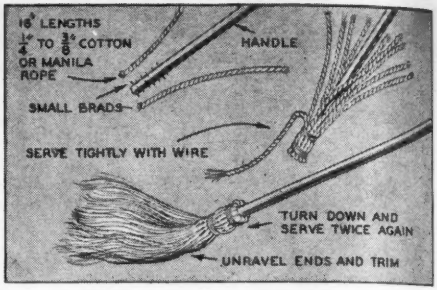
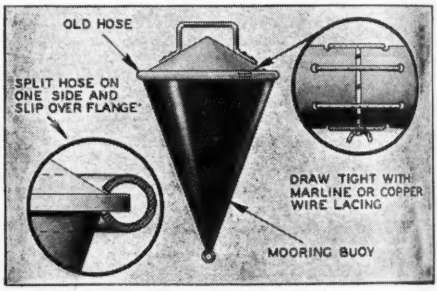
Boating Kinks



When that fancy cotton yacht mop you bought last season wears out, don't throw it away. Instead, cut off the business end and use the remaining handle to make this inexpensive deck mop. It will last as long as the store variety and the cost is practically nil. Use 18 inch lengths of old ¼ or ⅜ inch cotton or manila line to form the replacement mop. Drive small brads in the handle to hold the rope in place and serve the bundle tightly with copper wire. Before using the mop unravel and comb the ends of the lines.



An ordinary metal mooring buoy will mar the planking of a boat made fast to it, especially in calm spells when the hull rubs against the rusted flange of the can. To save yourself a headache at fitting out time, get a piece of old hose, long enough to go around the flange and use this as a bumper on the buoy. After splitting the hose down one side, spring it around the edge and cut it to length. Then punch a series of holes in both ends and use a marline or copper wire lacing to pull them together and hold the bumper in place.

Midge is easily handled.

Having trouble with the old dink? Then build MIDGE, a 7½ ft. plywood dinghy that's ideal as a tender or a boat for the kids. Construction is simple. M I Plan 927F is $1.00 postpaid.

Send your money order to: Fawcett Publications, Inc., Plan Dept., Greenwich, Conn.

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SOLD EVERYWHERE

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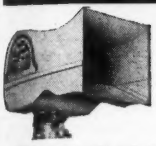

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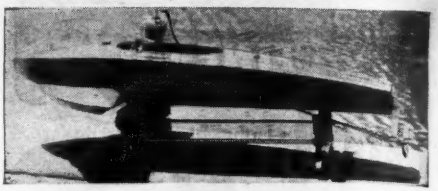
You'll be amazed by the sensational new mortar-like repair cement, that's so easy to use. Mixed only with water, X-Pandotite can be applied with a putty knife, or table knife. It's the permanent fixer for cracks, joints, loose fixtures, tile and 1001 other things that need repairing. For anchoring and molding purposes: X-Pandotite can be colored before using; stained or painted after hardening.

X-Pandotite is sold at leading hardware and paint stores at 35¢ for a ½ lb. can — 60¢ for a one lb. can.

If your dealer can't supply, send 50¢ for a ½ lb. or $1.00 for 1½ lbs. to the X-Pando Corp., 43-15 Thirty-Sixth St., Long Island City, N. Y. The X-Pandotite will be sent prepaid.

X-PANDOTITE

New Model Speed Boat



If you're a model speedboat fan you'll be interested in the racing hydroplane "Jeeno" manufactured by Artie Hasselbach's Consolidated Model Engineering Company, 3087 Third Ave., N. Y., N. Y. Created by John Thorpe, one of the top model designers in the speedboat field, the "Jeeno" kit features die cut mahogany formers and keel members, precision fittings and all parts, including the sponsoons, cut to shape and ready for assembly. The hull is 27 inches long, has a beam of 8 inches and is ideal for the Hornet or McCoy engine although any other power plant of the same displacement can be used.

New Ears for the Deaf

[*Continued from page* 166]

vogue, and for "hear rings," which are ladies' receivers cleverly concealed within decorative ear-rings.

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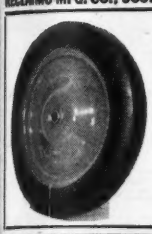

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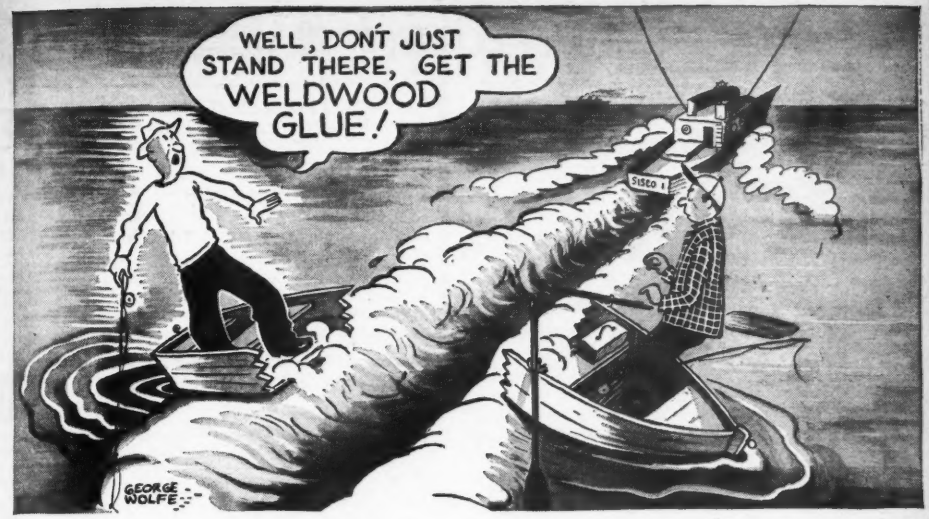

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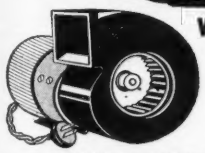

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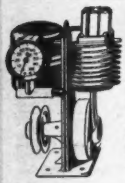

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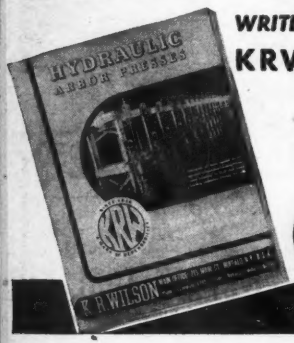

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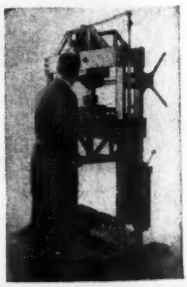

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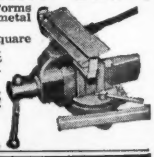

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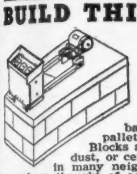

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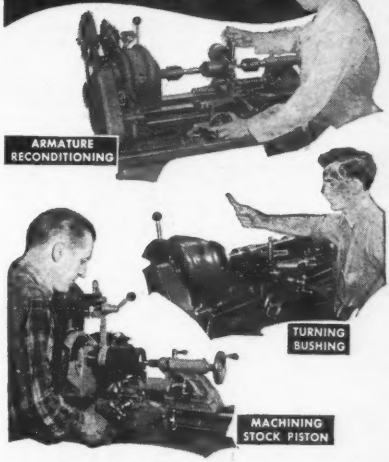

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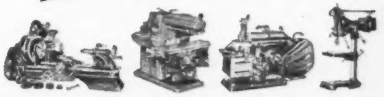

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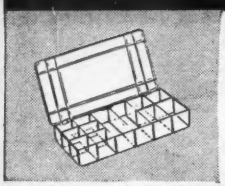

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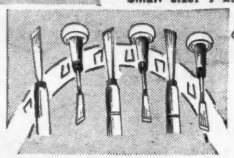

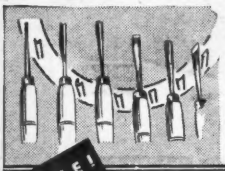

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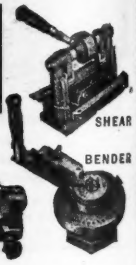

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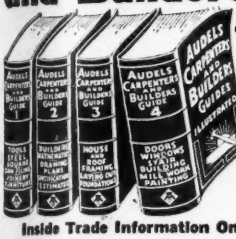

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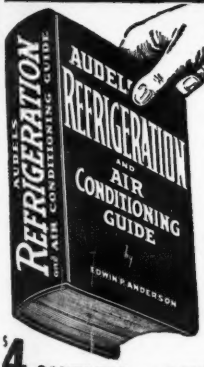

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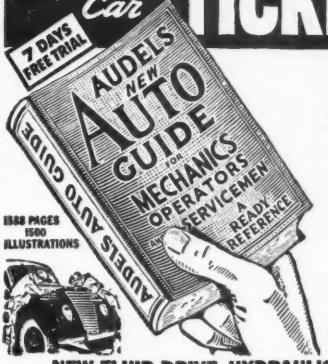

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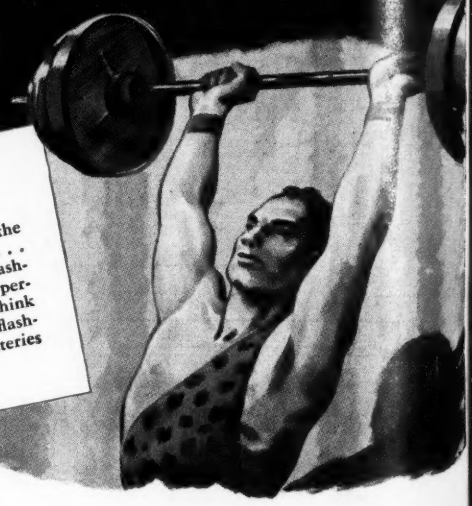

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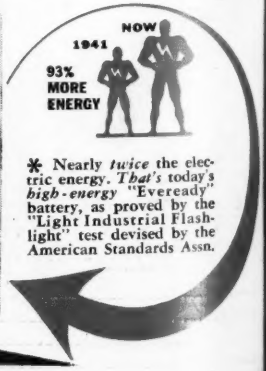

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